Issued October 1969

SOIL SURVEY

Vernon County, Wisconsin

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF WISCONSIN
Wisconsin Geological and Natural History Survey
Soil Survey Division
and
Wisconsin Agricultural Experiment Station

Major fieldwork for this soil survey was done in the period 1958–64. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1964. This survey was made cooperatively by the Soil Conservation Service, the Wisconsin Geological and Natural History Survey, Soil Survey Division, and the Wisconsin Agricultural Experiment Station, University of Wisconsin. It is part of the technical assistance furnished to the Vernon County Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in judging the suitability of tracts of land for agriculture, industry, or recreation.

Locating Soils

All of the soils of Vernon County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with a number shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit and woodland group in which the soil has been placed.

Interpretations not included in the text can be developed by using information in this survey to group soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units.

Foresters and others can refer to the section "Use of the Soils as Woodland," where the soils of the county are grouped according to their suitability for trees.

Engineers and builders will find under "Engineering Uses of the Soils" a table that gives estimates of the engineering properties of the soils in the county and one that interprets these properties in terms of their effect on engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Vernon County may be especially interested in the section "General Soil Map," in which broad patterns of soils are described. They may also be interested in the section "General Nature of the County."

Cover picture

Contour stripcropping on upland soils northwest of Viroqua. Fayette soils on upper part of slopes; Palsgrove soils downslope from Fayette soils; and Chaseburg soils in drainageways.

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SOIL SURVEY OF VERNON COUNTY, WISCONSIN

BY ROBERT W. SLOTA

FIELDWORK BY ROBERT W. SLOTA, W. W. ANDERSON, R. CHURCH, G. D. GARVEY, F. H. HAVERLAND, H. STRELOW, AND OTHERS, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE UNIVERSITY OF WISCONSIN, WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, SOIL SURVEY DIVISION, AND WISCONSIN AGRICULTURAL EXPERIMENT STATION

VERNON COUNTY is located in the southwestern part of Wisconsin (fig. 1). The county is composed of 21 civil townships. Viroqua is the county seat.

The total acreage of the county is 515,200 acres. About 40 percent of this is used as cropland, about 12 percent as pasture, and about 30 percent as woodland. The cropland and pasture are associated mainly with dairy farming, the principal farming enterprise in the county. Corn and oats are the main cultivated crops. Alfalfa hay and clover-timothy hay provide feed for livestock.

Most of the soils in the county formed from silty material deposited by wind over sandstone and dolomite bedrock. The county is in what is commonly known as the Driftless Area, in which no glacial deposits have been found. The soils, therefore, have been affected little if at all by glaciation.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Vernon County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Hixton and Norden, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially

Figure 1.—Location of Vernon County in Wisconsin.

alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Norden loam and Norden silt loam are two soil types in the Norden series. The difference in texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Norden silt loam, 2 to 6 percent slopes, moderately eroded, is one of several phases of Norden silt loam, a soil type that has a slope range of 2 to 45 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this survey was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed and occur in individual areas of such small size that it is not practical to show them separately on the map. They show such a mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Downs-Tama silt loams, 0 to 2 percent slopes.

Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are so slight that the separation is not important for the objectives of the soil survey. An example is Dunbarton and Sogn stony soils, 12 to 20 percent slopes.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the map like other mapping units, but are given descriptive names, such as Gullied land or Terrace escarpments, and are called land types instead of soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil surveys. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Vernon County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who need only a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts suitable for certain kinds of farming or other land uses. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The five soil associations in Vernon County are described in the following pages.

1. Downs-Tama-Fayette association

Silty, gently sloping to moderately steep, deep, well-drained soils on uplands

Association 1 is characterized by broad, undulating ridges (fig. 2). It occurs in the west-central part of the county, as one large area representing 8 percent of the total land area of the county. Downs and Tama soils together make up about 45 percent of the association, Fayette soils about 30 percent, Ashdale soils about 7 percent, and minor soils about 18 percent.

Downs and Tama soils are deep soils that formed in loess under a cover of prairie grass. They are underlain at a depth of more than 42 inches by either sandstone or dolomite. The slope range is 0 to 20 percent, but slopes of between 6 and 12 percent are most common.

Fayette soils formed in loess under trees. They are gently sloping to very steep.

Gale, Hixton, and Worthen soils are minor soils in this association. They occur as small, widely separated areas

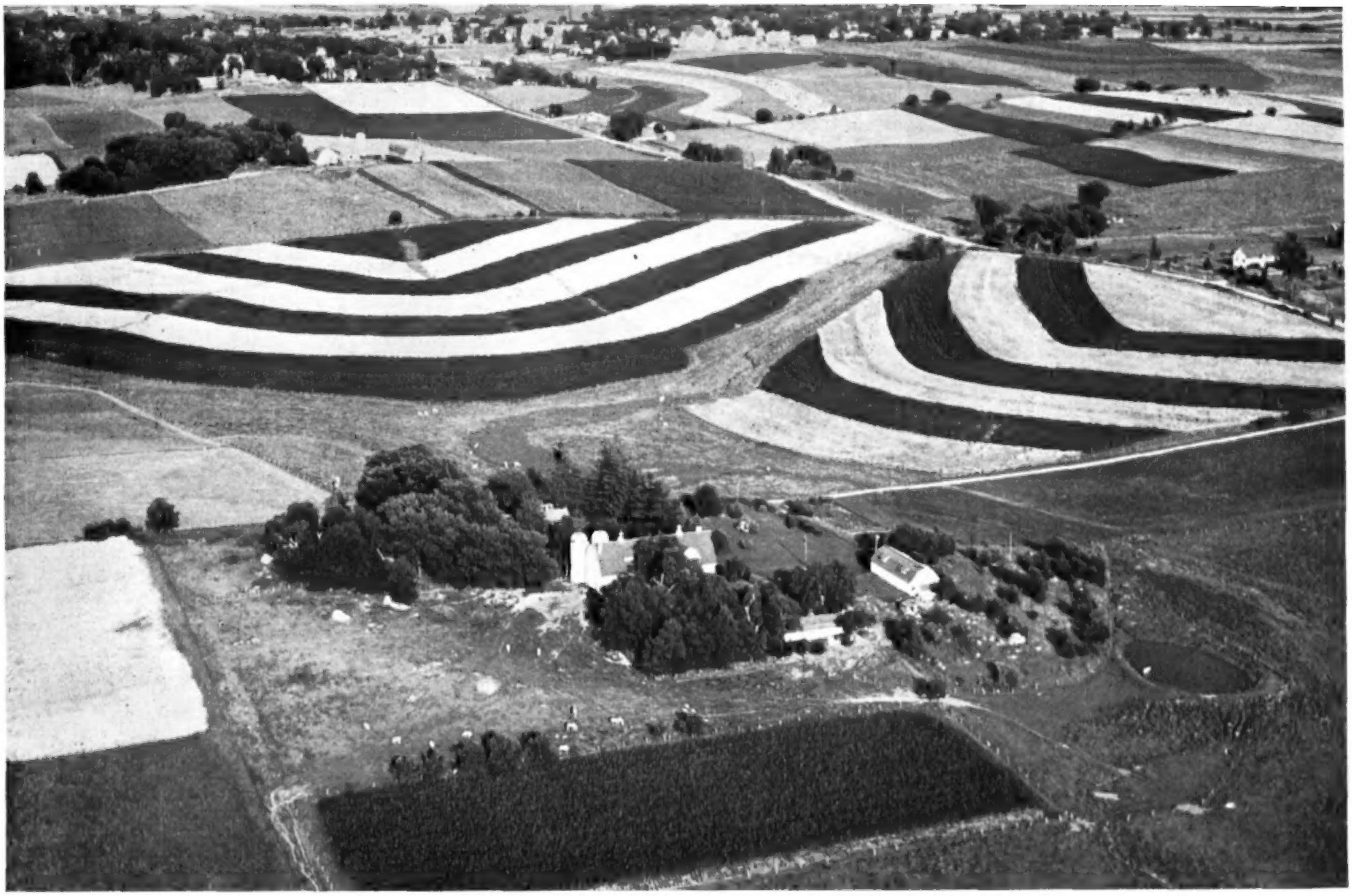

Figure 2.—**Landscape in association 1, near Westby.**

throughout the association. Gale soils are moderately deep, silty soils underlain by sand over sandstone. Hixton soils are loamy soils underlain by sandstone. Worthen soils, which are in upland drainageways, are dark-colored, silty soils that formed from material washed down from areas of Downs and Tama soils.

The soils of this association are very good for farming. If well managed, they are suited to a wide range of crops. Because of the thick surface layer, they do not show the effects of erosion as soon as some other soils of the county. General farms, on which dairying is the chief enterprise, are dominant.

2. *Fayette-Stony rock land-Dubuque association*

Steep, stony rock land and nearly level to moderately steep, silty, deep to shallow, well-drained soils on upland ridges

Association 2 is characterized by rolling ridgelands having convex slopes and by stony and rocky escarpments separating the ridgelands from lower slopes or bottom lands. This association is distributed throughout the county and makes up 59 percent of the total land area. Fayette soils make up about 30 percent of the association, Stony rock land about 30 percent, Dubuque soils about 20 percent, and minor soils about 20 percent. In this association, Fayette soils are dominant in the western part of the county and Dubuque soils in the eastern part.

Fayette soils are deep soils that formed under forest vegetation. They are underlain by either dolomitic limestone or by sandstone at a depth of more than 42 inches.

Dubuque soils are deep soils that formed under forest vegetation and are underlain at a depth of less than 40 inches by red, cherty clay residuum over dolomite. In some places in the eastern part of the county, Dubuque soils have a silty texture to a depth of 10 to 15 inches.

Stony rock land consists of steep rocky areas that generally have a shallow layer of sandy and silty soil material over dolomite or sandstone. The slope is 30 percent or more, and in places vertical.

Dairying and general farming are the chief types of farming. Although eroded as a result of past use, the Fayette and Dubuque soils are highly productive if well managed. Stony rock land, steep, is used mostly as pasture and woodland. Most of it could produce good stands of timber. It is highly erodible.

3. *Norden-Fayette association*

Loamy, nearly level to steep, moderately deep to deep, well-drained soils on valley slopes and bedrock benches

Association 3 is characterized by concave valley slopes, dissected convex slopes, and dissected bedrock benches (fig. 3). It is in the eastern half of the county and represents about 20 percent of the total land area. Norden soils make

up about 55 percent of the association, Fayette soils about 35 percent, and minor soils about 10 percent.

Norden soils formed in material weathered from green, glauconitic, fine-grained sandstone that contained siltstone and shale. These soils generally have convex slopes.

Fayette soils formed in silt deposits at least 42 inches thick over sandstone. They contain small amounts of sand or grit or a few small rock fragments, and in places they have a sandy smear on the surface.

Gale and Hixton soils, both of which formed in material weathered from sandstone, are minor soils in this association.

Dairying and general farming are the chief types of farming in this association. Many of the farms are combinations of bottom lands, valley slopes or bedrock benches, and some ridgeland. Erosion is a serious hazard, and in many places it is difficult to control. Many areas receive runoff from higher soils.

4. *Arenzville-Orion-Fayette association*

Loamy, nearly level to moderately steep, deep, well-drained to poorly drained soils on stream terraces and bottom lands

Association 4 consists predominantly of bottom lands and terraces along major streams of the county. It represents 10 percent of the total land area. Arenzville soils make up 30 percent of the association, Orion soils 25 percent, Fayette soils about 10 percent, and Ettrick, Chaseburg, Boaz, Rozetta, and Worthen soils about 5 percent each. The remaining 10 percent is made up of other minor soils, including Houghton, Huntsville, and Lawson soils.

Arenzville and Orion soils are the major soils on bottom lands. Arenzville soils are deep silt loams. They formed in recent alluvium and have very little horizon development. Orion soils are somewhat poorly drained silty soils.

Fayette silt loam, benches, is the major soil on the terraces. This is a level to gently sloping, deep soil underlain by coarse-textured alluvium. Many of the areas are irregular in shape.

Ettrick, Chaseburg, Boaz, Rozetta, and Worthen soils are on stream benches and upstream bottom lands.

Dairying and general farming are the main types of farming. The soils are highly productive, except for some stony and some sandy areas. Wetness and occasional to frequent flooding limit the use of the bottom lands. Tobacco is grown on the well drained and moderately well drained silty soils on terraces. On the bottom lands, corn and pasture are the main crops, but tobacco is grown in the better drained places. Artificial drainage of the bottom lands is difficult because of their position and lack of outlets.

Figure 3.—Landscape in association 3, near Hillsboro.

5. Alluvial land association

Mixed sand and silt alluvium on overflow bottom lands

Association 5 consists of Mississippi River bottom lands, islands, and sloughs. It represents 3 percent of the area of the county. Alluvial land makes up 45 percent of the association, and minor soils 55 percent. The minor soils include Huntsville, Boaz, Ettrick, and Lawson soils, which are on bottom lands, and a few areas of Rozetta and Stronghurst soils, which are on low terraces that are flooded occasionally.

This area is mostly wooded. It has been left in its natural state and is used for wildlife and recreation. Floods are frequent, and the water table is high.

Use and Management of the Soils

This section includes (1) an explanation of the system of capability classification used by the Soil Conservation Service, (2) discussions of management of the soils for crops and pasture, according to capability units, (3) predicted yields of the main crops, (4) discussions of woodland management, by groups of soils, and (5) estimates of and interpretations of the engineering properties of the soils.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment when used for the common field crops or pasture crops. The classification does not apply to most horticultural crops or to rice and other crops that have special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive land-forming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groupings, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I. Soils that have few limitations that restrict their use.

Class II. Soils that have some moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils that have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV. Soils that have very severe limitations that restrict the choice of plants, or require very careful management, or both.

Class V. Soils that are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms that have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages, the capability units in Vernon County are described and suggestions for the use and management of the soils are given. Unless the unit contains only one soil, the soils are identified only by the name of the series. Listing of the series name does not mean that all the soils of that series are in the particular unit. To find the classification of individual soils, refer to the "Guide to Mapping Units" at the back of this soil survey. Where the need for lime and fertilizer is indicated in the suggestions for management, the amount of lime and the kinds and amounts of fertilizer to apply should be determined by soil tests. The capability units are not numbered consecutively, because not all of the capability units used in Wisconsin are represented in this county.

CAPABILITY UNIT I-1

This unit consists of nearly level, well drained to moderately well drained, deep, silty soils of the Chaseburg, Downs, Fayette, Rozetta, Tama, and Worthen series. These soils are moderately permeable. They have a high to moderately high moisture-supplying capacity and moderate

natural fertility. Tilth is good and is easy to maintain. The dark-colored soils in this group are higher in organic-matter content than the other soils, are more permeable, and are easier to maintain in good tilth.

If the fertility is maintained, the soils in this unit can be used intensively for corn, peas, potatoes, and other special crops, and for field corn, small grain, and forage crops. They are well suited to trees and can be used to provide food and cover for wildlife.

A suitable cropping system for these soils is 2 years of row crops followed by 1 year of small grain and 1 year of hay. Row crops can be grown continuously if management includes minimum tillage, chemical weed control, the regular addition of all plant residues produced or of other organic material, and adequate applications of fertilizer.

Crops respond favorably to the application of barnyard manure and commercial fertilizer. It is important to maintain the organic-matter content and preserve soil structure.

CAPABILITY UNIT IIe-1

This unit consists of gently sloping, well drained to moderately well drained, deep, silty soils of the Ashdale, Downs, Fayette, Medary, Palsgrove, Rozetta, and Tama series. These soils are moderately permeable. They have a high to moderately high moisture-supplying capacity and moderately high natural fertility. Good tilth is fairly easy to maintain. The Ashdale, Downs, and Tama soils are higher in organic-matter content than the other soils, are more permeable, and are easier to keep in good tilth.

The soils in this unit are well suited to corn, small grain, grass, legumes, and special crops. They can also be used as permanent pasture, as woodland, and to provide food and cover for wildlife.

The moderate erosion hazard is the main limitation. If no measures for erosion control are applied, the cropping system should include only one row crop in 4 years. With measures for control of erosion, a suitable system is 1 year of a row crop, 1 year of small grain, and 2 or 3 years of hay. Effective control of erosion can be accomplished by tilling on the contour, growing cover crops, terracing long regular slopes, providing grassed waterways for safe removal of excess water, and diverting water that runs off adjoining higher areas. Also, the use of large amounts of crop residue is beneficial. Hybrid corn that has been heavily fertilized leaves large amounts of residue. The cornstalks, if shredded and spread over the surface, help to check erosion during winter and spring, and when plowed under they supply organic matter and help to maintain good soil structure.

CAPABILITY UNIT IIe-2

This unit consists of gently sloping, well drained to moderately well drained soils of the Dubuque, Gale, Norden, Norwalk, and Tell series. These soils are underlain by sand or clay over bedrock, or by loose outwash sands. They have a silt loam or loam surface layer and a finer textured subsoil. They are slightly droughty and, unless protected, are subject to erosion.

The soils in this unit are used principally for growing corn, small grain, grass, and legumes. A few areas are used as permanent pasture, as woodland, or to provide food and cover for wildlife.

The moderate erosion hazard is the main limitation. If no measures to control erosion are applied, a suitable cropping system is 1 year of a row crop, 1 year of small grain, and at least 3 years of hay on slopes less than 200 feet long, or 4 years of hay on slopes 200 to 300 feet long. If erosion is controlled, a high proportion of cultivated crops can be grown in the cropping system. Effective control of erosion can be accomplished by terracing long slopes and diverting runoff. Barnyard manure and commercial fertilizer can be used to replace nutrients that have been lost through erosion or leaching.

Lime is beneficial if applied according to need.

CAPABILITY UNIT IIe-5

This unit consists of gently sloping, well drained to moderately well drained, deep, light-colored and dark-colored soils of the Chaseburg and Worthen series. These soils formed in alluvium in upland drainageways, at the foot of slopes, and on fans on valley slopes and bottom lands. They are moderately permeable and have a moderately high to high moisture-supplying capacity. Erosion and occasional flooding of short duration are hazards.

If adequately protected from flooding, the soils in this unit are well suited to corn, small grain, grass, and legumes. Areas that are somewhat inaccessible or are frequently flooded can be used as permanent pasture, as woodland, or to provide food and cover for wildlife.

Floods are more frequent in some areas of this unit than in others, and the need for protection varies. If erosion is controlled, a suitable cropping system is 1 year of a row crop followed by 1 year of small grain and 1 year of hay. Effective control of erosion can be accomplished by planting on the contour; growing a winter cover crop; using diversion terraces on slopes; and sloping, shaping, and seeding the natural waterways. Most of the fan-shaped areas are too small for contour stripcropping.

CAPABILITY UNIT IIw-1

Ettrick silt loam is the only soil in this unit. It is a poorly drained, deep soil in depressions on high bottoms. The fine-textured subsoil has moderately slow permeability. The organic-matter content is high, the moisture-supplying capacity is high, and the natural fertility is moderately high.

If artificially drained, this soil is well suited to corn, small grain, grass, and legumes. Alsike clover and Ladino clover can be grown instead of alfalfa in undrained areas. Areas that are not drained can be used as pasture or as meadow.

Tile drains can be used to remove surface water where suitable outlets are available. Some areas can be artificially drained by means of surface drains alone, but others need a combination of tile drains, surface drains, and diversion terraces. Tile is effective only if the structure of the surface layer permits excess moisture to infiltrate and move downward into the tile. Soil structure can be improved by growing grass and legumes, adding barnyard manure or green manure, and working the soil only when it is dry enough so it will not puddle.

A suitable cropping system is 3 years of row crops followed by 1 year of a small grain and 2 years of hay. It is possible to grow row crops continuously under a management system that includes fertilization, regular additions of organic matter, minimum tillage, and maintenance of tilth and structure.

CAPABILITY UNIT IIw-2

This unit consists of nearly level to gently sloping, somewhat poorly drained, deep, silty soils of the Muscatine and Stronghurst series. These soils are on stream terraces and broad ridges. They have moderately slow permeability, a high moisture-supplying capacity, and high natural fertility.

If artificially drained, these soils are well suited to corn, small grain, grass, and alfalfa. Alsike clover or Ladino clover can be grown instead of alfalfa in undrained areas.

Both surface drainage and tile drainage can be used. Some areas can be drained adequately by means of surface ditches alone, but others need a combination of tile and surface drains. Soil structure can be maintained or improved by growing grass and legumes, applying barnyard manure or plowing under green-manure crops, and avoiding working the soils when they are wet.

An example of a cropping system suitable for nearly level, adequately drained areas of these soils is 2 years of row crops, 1 year of small grain, and 2 years of hay. It is possible to grow row crops continuously under a management system that includes fertilization, regular additions of organic matter, minimum tillage, and maintenance of tilth and structure. Diversions may be needed to break up long slopes and to intercept water that runs off adjoining higher areas.

CAPABILITY UNIT IIw-11

This unit consists of nearly level to gently sloping, well drained to moderately well drained, deep, silty soils of the Arenzville and Huntsville series. These soils formed in recent alluvium on bottoms that are flooded occasionally. They are subject to streambank cutting. The moisture-supplying capacity is high, permeability is moderate, and the reaction is neutral.

If protected from flooding, the soils in this unit are well suited to corn, small grain, and legumes. The frequency of flooding varies from one area to another. Areas that are somewhat inaccessible or that are flooded frequently can be used as permanent pasture, as woodland, or to provide food and cover for wildlife.

If these soils are used for row crops, a suitable cropping system is 1 year of a row crop followed by 1 year of small grain and 1 year of hay. Row crops can be grown continuously if management includes fertilization and regular additions of organic matter as well as flood protection.

CAPABILITY UNIT IIw-13

This unit consists of nearly level, somewhat poorly drained, deep, silty soils of the Boaz, Lawson, and Orion series. The Lawson and Orion soils are on bottom lands and are subject to flooding. The Boaz soils are somewhat higher and are seldom flooded.

If artificially drained and protected from flooding, the soils in this unit are suited to corn, small grain, and legumes. Drainage generally can be provided by surface ditches. Areas that are somewhat inaccessible or that are frequently flooded can be used as permanent pasture, as woodland, or to provide food and cover for wildlife.

A suitable cropping system is 2 years of row crops followed by 1 year of small grain and 1 year of hay. It is possible to grow row crops continuously under a management system that includes, in addition to flood control, fertilization, regular additions of organic matter, the use of all crop residues, minimum tillage, and maintenance of good tilth.

CAPABILITY UNIT IIs-7

Medary silt loam, 0 to 2 percent slopes, is the only soil in this unit. It is a moderately well drained soil on high stream terraces. It developed in a thin silt mantle over reddish-brown silty clay.

The soil in this unit is suited to corn, small grain, grass, and legumes. It can also be used as permanent pasture, as woodland, or to provide food and cover for wildlife.

Slow drying in spring and after heavy rains delays cultivation. Drying is quicker if a surface drainage system is installed.

A suitable cropping system for this soil is 1 year of a row crop followed by 1 year of small grain and 2 years of hay. Where large amounts of barnyard manure, green manure, or crop residues have been used, the soil is friable and porous and has better tilth. Growing alfalfa or other legumes also improves the soil. Row crops can be grown continuously if all crop residues are used, fertility is maintained, minimum tillage is practiced, and chemicals are used to control weeds.

CAPABILITY UNIT IIIe-1

This unit consists of sloping, well drained and moderately well drained, deep soils of the Ashdale, Downs, Fayette, Lindstrom, Palsgrove, and Tama series. These soils have a silty clay loam subsoil. They are moderately permeable, have a moderately high to high moisture-supplying capacity, and are moderately high in natural fertility.

The soils in this unit are well suited to corn, small grain, grass, and legumes. They are also suitable for use as woodland and to provide food and cover for wildlife.

A suitable cropping system is 1 to 2 years of row crops followed by 1 year of small grain and 2 to 3 years of hay. Using a suitable cropping system, adding barnyard manure, plowing under green manure, and returning residues help to keep the soils in good tilth and permit moisture to soak into the ground readily. Growing crops in contour strips (fig. 4) with alternate strips of hay slows runoff, and properly installed terraces divert runoff from higher areas.

CAPABILITY UNIT IIIe-2

This unit consists of sloping, well drained to moderately well drained soils of the Dubuque, Gale, Hixton, Norden, Norwalk, Rockbridge, and Tell series. The soils are underlain by clayey limestone residuum, bedrock, loose sand, or gravel. They are slightly droughty, and they will erode unless protected.

These soils are used mainly for growing corn, small grain, grass, and legumes. They can also be used as permanent pasture, as woodland, or to provide food and cover for wildlife.

Special practices are needed to control erosion and to improve tilth. Using a suitable cropping system helps to improve the structure of the soil and promotes intake and storage of water. A suitable cropping system is 1 year of small grain and 3 years of hay. Some areas of Dubuque soils are too shallow over bedrock to allow terrace construction.

CAPABILITY UNIT IIIe-4

This unit consists of nearly level to gently sloping, well-drained, moderately deep sandy loams of the Dakota series.

Figure 4.—**Grain and hay in alternate strips on a Fayette silt loam. The slope is 6 to 12 percent.**

These soils developed on stream terraces and are underlain by loose outwash sand at a depth of 24 to 36 inches. The moisture-supplying capacity of these soils is not sufficient to maintain plant growth during prolonged periods of drought.

These soils are suited to corn, small grain, grass, and legumes. They can also be used as permanent pasture or to provide food and cover for wildlife.

The gently sloping soils of this unit are subject to both water erosion and wind erosion. The nearly level soils are subject to wind erosion. Keeping the surface rough or using crop residues as a mulch helps to control wind erosion and increase water intake. Crop residues, green manure, and barnyard manure improve the moisture-supplying capacity and reduce the erosion hazard. A suggested cropping system is 1 year of small grain and 2 years of hay. Crops do not respond as well to large amounts of fertilizer as do crops on soils that have a high moisture-supplying capacity. Small, frequent applications of fertilizer are more beneficial.

CAPABILITY UNIT IIIe-5

This unit consists of sloping, well drained to moderately well drained, deep soils of the Chaseburg and Worthen series. These soils developed in local alluvium along upland drainageways and on fans on valley slopes and bottom lands. They are subject to detrimental overwash during periods of heavy runoff. The erosion hazard is moderate.

If protected from runoff, the soils in this unit are suited to corn, small grain, grass, and legumes. Areas that are somewhat inaccessible or are flooded frequently can be used as permanent pasture, as woodland, or to provide food and cover for wildlife.

Dikes or diversions are generally needed for control of runoff. A suitable cropping system is 1 year of a row crop, 1 year of small grain, and 2 years of hay. Crops respond well to applications of barnyard manure and fertilizer.

CAPABILITY UNIT IIIe-8

Stronghurst silt loam, 6 to 12 percent slopes, moderately eroded, is the only soil in this unit. It is a somewhat poorly drained, deep, silty soil on upland ridges. It is generally in concave areas adjacent to upland drainageways. It has a slowly permeable substratum that restricts drainage and causes lateral seepage. The erosion hazard is moderate.

The soil in this unit is suited to corn, small grain, grass, and alfalfa if excess water is removed.

Diversions reduce the erosion hazard by controlling runoff from adjoining higher areas. Soil structure can be improved by growing grass and legumes and applying barnyard manure or plowing under green-manure crops. Working the soil when it is wet is likely to cause puddling and impair structure.

A suitable cropping system for this soil is 1 year of a row crop, 1 year of small grain, and 2 years of hay. Crops respond favorably to the application of commercial fertilizer.

CAPABILITY UNIT IIIw-9

Houghton muck is the only soil in this unit. This nearly level to gently sloping, poorly drained, deep soil developed from fibrous plant material. It is in seepage areas and depressions on bottom lands. The moisture-supplying capacity is high, and the fertility is low.

If artificially drained, this soil can be used for cultivated crops. If not drained, it can be used as meadow, as pasture, and to provide food and cover for wildlife. Reed canarygrass is a suitable pasture grass.

Both surface drainage and tile drainage are needed. Subsidence and wind erosion can become serious hazards unless drainage is controlled.

It is possible to grow row crops continuously if the soil is adequately drained, is protected from wind erosion, and is fertilized. Large amounts of phosphate and potash are needed.

CAPABILITY UNIT IIIw-12

This unit consists of Alluvial land and Kickapoo fine sandy loam. These are nearly level, well-drained to somewhat poorly drained soils on bottom lands. They are subject to flooding and to streambank cutting. In some areas, floodwaters have deposited sand, silt, gravel, and chert on the surface. Other areas are more susceptible to stream scouring, and some to both deposition and scouring. The frequency of flooding and the degree of wetness vary from one area to another.

Where the flood hazard is not too serious, row crops can safely be grown 1 year out of 4. Where floods are frequent, these soils can be used as pasture, as woodland, or to provide food and cover for wildlife.

Artificially drained areas that are protected from flooding can be used for row crops continuously if management includes minimum tillage, regular additions of organic matter, and fertilization. Surface drains or dikes help to prevent or minimize flooding.

CAPABILITY UNIT IVe-1

This unit consists of sloping to moderately steep, well-drained, deep, slightly to severely eroded, silty soils of the Ashdale, Downs, Fayette, Lindstrom, Palsgrove, Tama, and Worthen series. These soils have moderately high to high moisture-supplying capacity and moderate to high natural fertility. The severely eroded soils are low in organic-matter content and are difficult to keep in good tilth. The slightly and moderately eroded soils have strong slopes and are subject to severe erosion if not protected.

These soils can be used for small grain and hay, but they are better suited to pasture, trees, or wildlife food and cover.

The severe erosion hazard is the main limitation. If special practices are used, the soils are suitable for small grain and hay. Effective control of erosion can be accomplished by growing crops in contour strips with alternate strips of hay and by using diversions to protect long slopes and tilled fields from runoff. Fertilized and limed close-growing crops help to control erosion.

CAPABILITY UNIT IVe-2

This unit consists of sloping to moderately steep, well-drained, moderately deep, loamy soils of the Dodgeville, Dubuque, Gale, Hixton, Norden, Norwalk, Rockbridge, and Tell series. These soils are underlain by clayey residuum, limestone or sandstone bedrock, or loose sand and gravel. They are slightly droughty. The erosion hazard is severe.

The soils in this unit can be used for corn, small grain, grass, and legumes, but they ought to be kept in hay or pasture most of the time. Any erosion would be serious because of the moderate depth. These soils can also be used as woodland or to provide food and cover for wildlife.

Practices that slow down runoff and promote intake of moisture minimize the risk of drought damage to crops. Such practices include planting of crops in contour strips that alternate with strips of hay and use of diversion terraces. If special practices to control erosion and conserve moisture are not used, the cropping system should consist of small grain and hay.

CAPABILITY UNIT IVe-4

This unit consists of sloping, well-drained, moderately deep sandy loam soils of the Dakota and Hixton series. These soils are underlain by sandstone or loose sand and gravel. They are moderately droughty. The hazard of water erosion is moderate, and the hazard of wind erosion is slight.

The soils in this unit are suited to pasture and trees, and they can be used to provide food and cover for wildlife. An occasional row crop can be grown in a cropping system with small grain, grass, and legumes.

Keeping the surface rough or using crop residues as a mulch promotes intake of water and helps to control erosion by water or by wind. Turning under all crop residues, green-manure crops, and large amounts of barnyard manure also helps to control erosion, improves tilth, and builds up the organic-matter content and the supply of plant nutrients. Contour stripcropping, terracing, using diversions, and applying lime and fertilizer are also needed.

CAPABILITY UNIT IVs-3

This unit consists of nearly level to gently sloping, excessively drained, deep, loamy sands of the Sparta series. These soils formed in sandy outwash on stream terraces. They have a low moisture-supplying capacity and low natural fertility. They are droughty and are subject to wind erosion.

The soils of this unit are suited to permanent pasture and to trees, and they can be used to provide food and cover for wildlife. A row crop can be grown occasionally in a cropping system with small grain and hay.

Frequent, small applications of fertilizer are beneficial. The rapid downward movement of water leaches out plant nutrients and causes excessive loss of fertilizer if large amounts are applied. Barnyard manure, green-manure crops, and residues can be utilized to add organic matter. Regular additions of organic matter help to control wind erosion and increase the moisture-supplying capacity.

CAPABILITY UNIT Vw-14

This unit consists of Alluvial land, wet, and Orion silt loam, wet. These are nearly level, poorly drained, mixed silty, sandy, and gravelly soils on alluvial flood plains.

Those on the Mississippi River flood plain are made up of coarse sand and silt and are low in fertility. Those on the flood plains of the Kickapoo River and other streams of the county consist largely of silty material. In all areas, floods are frequent and the water table is permanently high.

These soils are suitable for use as pasture, as woodland, or to provide food and cover for wildlife. Drainage and flood protection that would make them suitable for crops are generally not practical. Some pastures can be protected from flooding well enough to be fertilized and renovated.

Vegetation that provides food and cover for many kinds of songbirds and game animals can be planted.

CAPABILITY UNIT Vw-16

This unit consists of Stony colluvial land, gently sloping, which includes sand, silt, gravel, cobblestones, and stones. It is generally near stream channels, but some areas are on fans.

This land type is subject to flooding. It is not suited to row crops. Stoniness, wetness, and the flood hazard restrict its use to pasture, woodland, or wildlife habitat.

CAPABILITY UNIT VIe-1

This unit consists of well-drained, deep, moderately steep and steep, silty soils of the Ashdale, Fayette, Lindstrom, and Palsgrove series. The hazard of erosion is very severe.

The soils of this unit are not suited to row crops. They are well suited to permanent pasture, to trees, and to food and cover for wildlife. Hay and pasture crops grow well, if fertilization, reseeding, or renovation are practiced. The slope and the erosion hazard restrict tillage.

Some of the soils in this unit are used as woodland. Part of the woodland is pastured, but damage from trampling of seedlings, removal of protective soil cover, and concentration of water in trials far outweigh the value of the feed obtained by livestock. In places, gullies have advanced into ridgetop areas that are suitable for crops.

In established pastures, the quality of the forage can be improved by renovating and seeding alfalfa and bromegrass. If limed and fertilized, alfalfa and bromegrass yield more forage than native bluegrass. Topdressing after the first year is beneficial to alfalfa. Topdressing with barnyard manure also improves pasture stands.

CAPABILITY UNIT VIe-2

This unit consists of moderately steep to steep, well-drained moderately deep, loamy soils of the Dubuque, Gale, Hixton, and Norden series, and the land type, Terrace escarpments, loamy. These soils are less than 3 feet deep, and they are underlain by sandstone or limestone bedrock. They are moderately to severely eroded. The steepness of slope and a severe erosion hazard restrict the type of tillage operations that can be carried out on these soils.

The soils of this unit are suited to pasture, hay, trees, and food and cover for wildlife. They are not suited to cultivated crops.

Seeding should be done by the renovation method, preferably in contour strips. Renovation conditions the surface layer so that it absorbs and retains large amounts of water. Legume-grass mixtures respond well to lime and fertilizer. Grassed waterways help to control erosion in areas of concentrated runoff, and diversions can be used in some areas to control runoff.

Many areas of these soils are used as woodland. Grazing can damage woodland. Livestock trample and damage young seedlings, damage the leaf litter, which absorbs and stores moisture, and make trails in which runoff concentrates and often forms gullies. Gullies once started are difficult to control and often encroach on cropland. Well-managed woodlots reduce runoff and thereby limit erosion of fields downslope and reduce the flood hazard in the stream valleys.

CAPABILITY UNIT VIe-4

Hixton sandy loam, 12 to 20 percent slopes, moderately eroded, is the only soil in this unit. It is a well-drained, shallow to moderately deep sandy loam underlain by sandstone bedrock. The moisture-supplying capacity is low. The erosion hazard is severe.

The soil in this unit is not suited to row crops. It is suited to pasture and trees and can be used to provide food and cover for wildlife. Good pasture stands can be established by seeding with a legume-grass mixture and applying adequate amounts of lime, manure, and fertilizer.

Many areas of this soil are used as woodland.

CAPABILITY UNIT VIs-3

Sparta loamy sand, 6 to 12 percent slopes, eroded, is the only soil in this unit. It is an excessively drained, deep, sandy soil that has a loose substratum. The moisture-supplying capacity is low, and the natural fertility is low. Droughtiness is a serious limitation, especially in years of low or poorly distributed rainfall.

The soil in this unit is too droughty and too susceptible to erosion to be used for row crops. Keeping it in permanent vegetation and using it for hay and pasture, for trees, or for wildlife food and cover help to control erosion. Heavy applications of fertilizer and manure help to establish satisfactory pasture stands. Rotation of grazing and control of grazing help to control adequate cover.

CAPABILITY UNIT VIs-5

Dunbarton and Sogn stony soils, 12 to 20 percent slopes, are the only soils in this unit. These are shallow to very shallow soils underlain by limestone bedrock. They have a low moisture-supplying capacity and moderately low natural fertility. The water erosion hazard is severe.

The soils of this unit are suited to pasture, to woodland, and to wildlife food and cover. Control of grazing and topdressing in some places improve the pasture stands. Maintaining a good cover of sod is difficult.

CAPABILITY UNIT VIs-6

This unit consists of two land types, Stony colluvial land, sloping, and Stony rock land, moderately steep. These units are moderately well drained to well drained. They are moderate to low in natural fertility and in moisture-supplying capacity.

The stony nature of these land types restricts their use to meadow, pasture, woodland, or wildlife habitat. Some areas can be cleared of surface rocks so that pastures can be renovated. Topdressing may be substituted for renovation. The erosion hazard ranges from moderate to severe, depending on slope.

CAPABILITY UNIT VIIe-1

Fayette silt loam, valleys, 30 to 45 percent slopes, is the only soil in this unit. It is a well-drained, moderately deep to deep, light-colored, silty soil. The erosion hazard is very severe.

The soil in this unit needs a protective cover of grass or trees. It is suitable for use as woodland or as wildlife habitat. Under careful management, it can be used for pasture.

Pasture fertilization is most effective if done early in spring, or as soon as frost is out of the ground. Control of grazing helps to maintain a good stand of grass throughout the year and prevent erosion. If the south-facing slopes become eroded, they are difficult to reseed, and they generate runoff that damages both the immediate pasture land and lower areas.

Protecting woodland from damage by livestock and fire helps to maintain good stands of timber. Selective cutting encourages the growth of the more desirable kinds of trees.

CAPABILITY UNIT VIIe-2

This unit consists of well-drained, steep to very steep, moderately deep to shallow, light-colored, loamy soils of the Dubuque, Gale, and Norden series. These soils are underlain by sandstone or limestone bedrock. The slope prevents the operation of farm machinery, and the erosion hazard is severe.

Although better suited to trees, these soils can be used for pasture if they are well managed. Pastures should have a good vegetative cover. The less steep areas can be renovated once every five years. Permanent bluegrass pastures are improved by the application of fertilizer high in nitrogen content. Careful control of grazing protects the soils from gullying. Both wooded and open areas can be improved as wildlife habitat by planting suitable vegetation.

CAPABILITY UNIT VIIe-4

This unit consists of Gullied land and soils of the Hixton series. The Hixton soils are steep, well-drained, shallow to moderately deep, droughty sandy loams underlain by sandstone bedrock. The erosion hazard is very severe.

The soils in this unit are suited to trees and to pasture for limited use. Pasture stands are improved by applying fertilizer high in nitrogen content. Bluegrass pasture should be fertilized as early in spring as possible. A few areas, where the slope is not too steep and machinery can be operated, can be renovated once every 5 years. Careful regulation of grazing helps to prevent gullying. Protecting wooded areas from both livestock and fire helps to maintain stands.

CAPABILITY UNIT VIIs-5

This unit consists of Dunbarton and Sogn stony soils, 20 to 30 percent slopes, and Terrace escarpments, sandy. These are excessively drained, shallow and very shallow soils underlain by bedrock or coarse sandy and gravelly material, generally at a depth of less than 2 feet. The moisture-supplying capacity is low.

The soils in this unit are suited to trees and to wildlife food and cover. They have very limited use as pasture. Unless a good sod cover is maintained by control of grazing, pastures are very susceptible to erosion.

Protecting woodland from livestock and fire helps to maintain stands. The growth of the more desirable kinds of trees can be encouraged by selective cutting. Wildlife can be attracted to wooded areas by piling brush along the edge of and near openings, by leaving den trees standing, and by keeping shrubs in woodland borders.

CAPABILITY UNIT VIIs-6

This unit consists of Stony rock land, steep. This land type is well drained to excessively drained. The soil material is very shallow to moderately deep and is variable in texture. The bedrock is limestone and sandstone. The degree of stoniness varies from place to place. Large boulders are common. The hazard of erosion is very severe.

Most areas of this land type can support trees, but the hot south-facing slopes, which are known as "goat prairies," have only a minimum cover of grass. Protecting these goat prairies from livestock and from fire helps to maintain a vegetative cover.

CAPABILITY UNIT VIIs-9

This unit consists of excessively drained, shallow, sandy soils of the Boone series. These soils are moderately steep to very steep. They are underlain by sandstone bedrock. They have very rapid permeability, low moisture-supplying capacity, and low natural fertility. The hazard of erosion is very severe.

These soils are suited to trees and to wildlife food and cover. A good cover of vegetation helps to control erosion.

CAPABILITY UNIT VIIIw-15

This unit consists of the land type Marsh. These areas are flooded almost continuously. The vegetation consists of cattails, bulrushes, sedges, and other plants suited to wet soil or shallow water.

This land type is not suited to pasture or trees, but it provides food and cover for wildlife. Some areas can be improved as habitat for ducks, muskrats, and other wildlife by building level ditches or dikes to control the water level, or by constructing ponds.

Predicted Yields

Table 1 gives predicted long-term average yields per acre for each soil and land type in Vernon County. The predictions are based on interviews with farmers, on actual yields obtained on test plots, and on the observations of soil scientists, work unit conservationists, and other agricultural workers familiar with the soils of the county (*2*).[1]

The columns headed "A" show what yields can be expected under the kind of management common in the county at the time this soil survey was made. This level of management includes the following practices:

1. Applying barnyard manure, applying starter fertilizer to corn, and applying little or no fertilizer to small grain and hay.
2. Planting hybrid corn at the rate of about 12,000 plants per acre.
3. Applying a minimum amount of lime to alfalfa, cutting twice a year, and grazing the fields in fall.
4. Using no special practices in preparing seedbeds or in cultivating.

[1] Italic numbers in parentheses refer to Literature Cited, page 80.

TABLE 1.—*Predicted yields of principal field and pasture crops under two levels of management*

[Yields in column A are those to be expected under common management; yields in column B those to be expected under the improved management described in the text. Dashes in columns indicate the soil is not suitable for or is not commonly used for the specified crop]

Soil	Corn		Oats		Alfalfa-brome hay		Pasture, mainly bluegrass	
	A	B	A	B [1]	A	B	A	B
	Bu./acre	*Bu./acre*	*Bu./acre*	*Bu./acre*	*Tons/acre*	*Tons/acre*	*A.U.M.* [2]	*A.U.M.* [2]
Alluvial land [3]	45	75	40	60	2.0	3.0	100	145
Alluvial land, wet	------	------	------	------	------	------	------	------
Arenzville silt loam [3]	80	110	50	70	3.0	4.5	110	145
Ashdale silt loam, 2 to 6 percent slopes, moderately eroded	70	100	55	70	2.6	3.4	95	125
Ashdale silt loam, 6 to 12 percent slopes, moderately eroded	60	90	50	65	2.8	3.3	90	125
Ashdale silt loam, 12 to 20 percent slopes, moderately eroded	50	85	45	60	2.4	3.0	90	125
Ashdale silt loam, 12 to 20 percent slopes, severely eroded	------	------	------	------	2.0	3.0	80	120
Boaz silt loam	------	85	------	65	------	3.5	90	130
Boone loamy sand, 12 to 30 percent slopes	------	------	------	------	------	------	20	40
Boone loamy sand, 30 to 45 percent slopes	------	------	------	------	------	------	20	35
Chaseburg silt loam, 0 to 2 percent slopes	75	105	50	70	3.5	4.5	110	145
Chaseburg silt loam, 2 to 6 percent slopes	75	105	50	70	3.5	4.5	105	140
Chaseburg silt loam, 6 to 12 percent slopes	65	100	48	70	3.3	4.5	100	135
Dakota sandy loam, 0 to 2 percent slopes	55	75	40	55	2.0	3.0	80	115
Dakota sandy loam, 2 to 6 percent slopes	55	75	40	55	2.0	3.0	80	115
Dakota sandy loam, 2 to 6 percent slopes, moderately eroded	45	70	37	55	1.75	2.75	75	110
Dakota sandy loam, 6 to 12 percent slopes, moderately eroded	35	65	35	50	1.5	2.5	70	100
Dodgeville silt loam, 12 to 20 percent slopes, moderately eroded	45	70	45	60	2.2	2.9	75	110
Downs-Tama silt loams, 0 to 2 percent slopes	75	115	60	75	3.0	4.5	110	140
Downs-Tama silt loams, 2 to 6 percent slopes	85	120	65	80	3.0	4.5	105	140
Downs-Tama silt loams, 2 to 6 precent slopes, moderately eroded	85	120	65	80	2.8	4.5	100	140
Downs-Tama silt loams, 6 to 12 percent slopes, moderately eroded	75	100	60	75	2.7	3.4	90	135
Downs-Tama silt loams, 12 to 20 percent slopes, moderately eroded	70	90	55	70	2.5	3.0	85	130
Dubuque silt loam, 2 to 6 percent slopes	50	75	40	60	2.4	3.0	75	115
Dubuque silt loam, 2 to 6 percent slopes, moderately eroded	45	73	38	58	2.2	2.8	70	110
Dubuque silt loam, 6 to 12 percent slopes	48	75	38	60	2.2	2.8	70	115
Dubuque silt loam, 6 to 12 percent slopes, moderately eroded	45	70	35	55	2.0	2.7	65	100
Dubuque silt loam, 12 to 20 percent slopes	48	75	38	58	2.0	2.6	65	95
Dubuque silt loam, 12 to 20 percent slopes, moderately eroded	45	70	35	55	1.8	2.5	60	85
Dubuque silt loam, 20 to 30 percent slopes	------	------	35	50	1.8	2.5	60	85
Dubuque silt loam, 20 to 30 percent slopes, moderately eroded	------	------	32	48	1.5	2.3	55	80
Dubuque silt loam, 30 to 45 percent slopes	------	------	------	------	------	------	55	------
Dubuque soils, 6 to 12 percent slopes, severely eroded	40	60	35	55	1.8	2.5	55	80
Dubuque soils, 12 to 20 percent slopes, severely eroded	------	------	32	55	1.7	2.5	50	80
Dubuque soils, 20 to 30 percent slopes, severely eroded	------	------	------	------	------	------	45	75
Dubuque-Gale silt loams, 2 to 6 percent slopes:								
Dubuque	50	75	40	60	2.4	3.0	75	115
Gale	55	80	50	68	2.3	3.0	75	110
Dubuque-Gale silt loams, 2 to 6 percent slopes, moderately eroded:								
Dubuque	45	73	38	58	2.2	2.8	70	110
Gale	52	78	48	65	2.2	2.8	70	110
Dubuque-Gale silt loams, 6 to 12 percent slopes, moderately eroded:								
Dubuque	45	70	35	55	2.8	2.7	65	100
Gale	50	76	40	60	1.8	2.4	65	100
Dubuque-Gale silt loams, 12 to 20 percent slopes, moderately eroded:								
Dubuque	45	70	35	55	1.8	2.5	60	85
Gale	45	70	38	55	1.6	2.2	60	90
Dunbarton and Sogn stony soils, 12 to 20 percent slopes	------	------	------	------	------	------	50	70
Dunbarton and Sogn stony soils, 20 to 30 percent slopes	------	------	------	------	------	------	45	65
Ettrick silt loam	------	85	------	70	------	3.5	80	145
Fayette silt loam, uplands, 2 to 6 percent slopes	70	110	60	75	3.0	4.5	100	140
Fayette silt loam, uplands, 2 to 6 percent slopes, moderately eroded	65	110	55	75	2.8	4.0	90	130
Fayette silt loam, uplands, 6 to 12 percent slopes	63	110	58	75	3.0	4.0	95	135
Fayette silt loam, uplands, 6 to 12 percent slopes, moderately eroded	60	100	55	75	2.8	4.0	85	130
Fayette silt loam, uplands, 12 to 20 percent slopes	60	95	45	65	2.5	3.5	85	125
Fayette silt loam, uplands, 12 to 20 percent slopes, moderately eroded	50	80	43	65	2.3	3.2	80	130
Fayette silt loam, uplands, 12 to 20 percent slopes, severely eroded	------	------	40	55	2.0	2.8	70	115
Fayette silt loam, uplands, 20 to 30 percent slopes	------	------	40	65	2.2	2.8	75	115
Fayette silt loam, uplands, 20 to 30 percent slopes, moderately eroded	------	------	35	60	1.8	2.5	65	105
Fayette silt loam, benches, 0 to 2 percent slopes	70	115	60	75	3.0	4.5	100	145
Fayette silt loam, benches, 2 to 6 percent slopes	70	110	60	75	3.0	4.5	100	140
Fayette silt loam, benches, 2 to 6 percent slopes, moderately eroded	65	110	58	75	2.8	4.0	90	130
Fayette silt loam, benches, 6 to 12 percent slopes, moderately eroded	60	100	55	75	2.8	4.0	85	130
Fayette silt loam, valleys, 6 to 12 percent slopes	58	88	52	75	3.0	3.5	98	142

See footnotes at end of table.

TABLE 1.—*Predicted yields of principal field and pasture crops under two levels of management*—Continued

Soil	Corn		Oats		Alfalfa-brome hay		Pasture, mainly bluegrass	
	A	B	A	B[1]	A	B	A	B
	Bu./acre	*Bu./acre*	*Bu./acre*	*Bu./acre*	*Tons/acre*	*Tons/acre*	*A.U.M.*[2]	*A.U.M.*[2]
Fayette silt loam, valleys, 6 to 12 percent slopes, moderately eroded	55	85	50	75	2.8	3.4	90	130
Fayette silt loam, valleys, 12 to 20 percent slopes	50	85	47	75	2.7	3.4	88	130
Fayette silt loam, valleys, 12 to 20 percent slopes, moderately eroded	48	75	45	65	2.6	3.2	85	130
Fayette silt loam, valleys, 20 to 30 percent slopes	---	---	45	65	2.6	3.2	85	130
Fayette silt loam, valleys, 20 to 30 percent slopes, moderately eroded	---	---	43	60	2.5	3.0	80	125
Fayette silt loam, valleys, 30 to 45 percent slopes	---	---	---	---	---	---	70	100
Gale silt loam, 2 to 6 percent slopes, moderately eroded	52	78	48	65	2.2	2.8	70	110
Gale silt loam, 6 to 12 percent slopes, moderately eroded	50	76	40	60	1.8	2.4	65	100
Gale silt loam, 12 to 20 percent slopes, moderately eroded	45	70	38	55	1.6	2.2	60	90
Gale silt loam, 20 to 30 percent slopes	---	---	38	55	1.6	2.2	60	90
Gale silt loam, 20 to 30 percent slopes, moderately eroded	---	---	35	50	1.6	2.2	55	85
Gale silt loam, 30 to 45 percent slopes	---	---	---	---	---	---	50	---
Gullied land	---	---	---	---	---	---	---	---
Hixton loam, 6 to 12 percent slopes, moderately eroded	40	73	40	50	1.5	3.0	60	100
Hixton loam, 12 to 20 percent slopes, moderately eroded	35	65	36	48	1.2	2.1	55	85
Hixton loam, 20 to 30 percent slopes, moderately eroded	---	---	25	43	1.2	1.8	51	80
Hixton sandy loam, 6 to 12 percent slopes, moderately eroded	38	65	32	55	1.3	2.1	50	85
Hixton sandy loam, 12 to 20 percent slopes, moderately eroded	---	---	30	50	1.0	2.0	45	80
Hixton sandy loam, 20 to 30 percent slopes	---	---	28	48	1.0	2.0	40	70
Hixton sandy loam, 20 to 30 percent slopes, moderately eroded	---	---	25	45	.8	1.8	35	65
Hixton soils, 30 to 45 percent slopes	---	---	---	---	---	---	45	---
Houghton muck	---	90	---	60	---	3.8	60	130
Huntsville silt loam	80	110	55	70	3.2	4.5	115	150
Kickapoo fine sandy loam	75	100	45	65	3.0	4.5	105	140
Lawson silt loam	[4] 80	110	---	70	---	3.5	95	150
Lindstrom silt loam, 6 to 12 percent slopes, moderately eroded	55	85	45	65	2.8	3.4	90	130
Lindstrom silt loam, 12 to 20 percent slopes, moderately eroded	60	90	40	62	2.6	3.3	80	125
Lindstrom silt loam, 20 to 30 percent slopes, moderately eroded	---	---	37	60	2.5	3.2	75	120
Marsh	---	---	---	---	---	---	---	---
Medary silt loam, 0 to 2 percent slopes	60	85	55	70	2.5	4.0	95	130
Medary silt loam, 2 to 6 percent slopes, eroded	60	80	50	70	2.5	4.0	90	125
Muscatine silt loam, benches, 0 to 2 percent slopes	75	115	45	70	2.5	4.0	95	150
Muscatine silt loam, benches, 2 to 6 percent slopes	70	110	50	70	3.0	4.0	95	150
Norden fine sandy loam, 12 to 20 percent slopes, moderately eroded	40	65	40	50	1.6	2.5	55	90
Norden fine sandy loam, 20 to 30 percent slopes	---	---	38	50	1.7	2.2	60	95
Norden fine sandy loam, 20 to 30 percent slopes, moderately eroded	---	---	35	45	1.5	2.0	50	85
Norden fine sandy loam, 30 to 45 percent slopes	---	---	---	---	---	---	45	---
Norden loam, 6 to 12 percent slopes, moderately eroded	50	80	45	60	2.2	3.5	75	120
Norden loam, 12 to 20 percent slopes	50	75	47	60	2.0	3.2	75	115
Norden loam, 12 to 20 percent slopes, moderately eroded	45	70	45	55	1.8	3.0	70	110
Norden loam, 20 to 30 percent slopes	---	---	40	55	1.7	2.5	70	105
Norden loam, 20 to 30 percent slopes, moderately eroded	---	---	35	50	1.5	2.0	65	100
Norden silt loam, 2 to 6 percent slopes, moderately eroded	60	95	55	70	2.7	4.2	85	130
Norden silt loam, 6 to 12 percent slopes, moderately eroded	55	90	53	65	2.8	4.0	80	120
Norden silt loam, 12 to 20 percent slopes	55	85	55	65	2.5	3.5	85	125
Norden silt loam, 12 to 20 percent slopes, moderately eroded	50	80	50	60	2.2	3.2	75	120
Norden silt loam, 20 to 30 percent slopes	---	---	45	60	2.0	2.5	70	110
Norden silt loam, 20 to 30 percent slopes, moderately eroded	---	---	35	55	1.8	2.2	65	100
Norden silt loam, 30 to 45 percent slopes	---	---	---	---	---	---	45	---
Norwalk silt loam, 2 to 6 percent slopes, eroded	65	95	47	63	2.3	3.5	80	120
Norwalk silt loam, 6 to 12 percent slopes, moderately eroded	60	90	45	60	2.0	3.5	75	115
Norwalk silt loam, 12 to 20 percent slopes, moderately eroded	55	85	43	58	1.8	3.0	70	110
Orion silt loam	65	100	45	65	---	3.5	95	105
Orion silt loam, wet	---	---	---	---	---	---	85	100
Palsgrove silt loam, 2 to 6 percent slopes	75	110	60	75	2.8	3.4	90	135
Palsgrove silt loam, 2 to 6 percent slopes, moderately eroded	70	100	60	75	2.6	3.2	85	125
Palsgrove silt loam, 6 to 12 percent slopes	70	100	55	70	2.6	3.3	85	130
Palsgrove silt loam, 6 to 12 percent slopes, moderately eroded	70	100	55	70	2.4	3.2	80	125
Palsgrove silt loam, 12 to 20 percent slopes	60	90	50	70	2.4	3.2	80	125
Palsgrove silt loam, 12 to 20 percent slopes, moderately eroded	55	85	45	65	2.2	3.0	75	115
Palsgrove silt loam, 12 to 20 percent slopes, severely eroded	---	---	35	60	2.0	3.0	70	115
Palsgrove silt loam, 20 to 30 percent slopes	---	---	40	62	2.2	3.0	75	115
Palsgrove silt loam, 20 to 30 percent slopes, moderately eroded	---	---	35	60	2.0	3.0	70	110
Rockbridge silt loam, 6 to 12 percent slopes, moderately eroded	50	85	45	60	2.2	3.5	75	120
Rockbridge silt loam, 12 to 20 percent slopes, moderately eroded	45	80	40	55	2.0	3.0	70	115
Rozetta silt loam, benches, 0 to 2 percent slopes	75	115	55	75	3.0	3.5	100	145
Rozetta silt loam, benches, 2 to 6 percent slopes	75	115	55	70	3.0	3.5	95	140
Sparta loamy sand, 0 to 2 percent slopes	35	50	30	40	1.3	1.8	40	60

See footnotes at end of table.

TABLE 1.—*Predicted yields of principal field and pasture crops under two levels of management*—Continued

Soil	Corn		Oats		Alfalfa-brome hay		Pasture, mainly bluegrass	
	A	B	A	B [1]	A	B	A	B
	Bu./acre	*Bu./acre*	*Bu./acre*	*Bu./acre*	*Tons/acre*	*Tons/acre*	*A.U.M.*[2]	*A.U.M.*[2]
Sparta loamy sand, 2 to 6 percent slopes, eroded	35	50	25	38	1. 0	1. 5	30	50
Sparta loamy sand, 6 to 12 percent slopes, eroded			20	30	. 9	1. 3	25	45
Stony colluvial land, gently sloping								
Stony colluvial land, sloping								
Stony rock land, moderately steep								
Stony rock land, steep								
Stronghurst silt loam, 2 to 6 percent slopes, moderately eroded	50	90	45	65	2. 0	4. 0	85	120
Stronghurst silt loam, 6 to 12 percent slopes, moderately eroded	45	85	40	60	1. 8	3. 5	80	110
Stronghurst silt loam, benches, 0 to 2 percent slopes	50	90	50	65	2. 0	4. 0	90	125
Stronghurst silt loam, benches, 2 to 6 percent slopes	55	90	55	65	2. 5	4. 0	90	125
Tama silt loam, benches, 0 to 2 percent slopes	85	120	60	75	3. 0	4. 5	110	140
Tama silt loam, benches, 2 to 6 percent slopes	85	120	58	75	3. 0	4. 5	105	140
Tama silt loam, benches, 6 to 12 percent slopes, moderately eroded	75	110	53	70	2. 8	4. 0	90	130
Tell silt loam, 2 to 6 percent slopes, eroded	55	90	45	63	2. 5	4. 0	80	125
Tell silt loam, 6 to 12 percent slopes, moderately eroded	50	85	43	60	2. 2	3. 5	75	120
Tell silt loam, 12 to 20 percent slopes, moderately eroded	45	80	40	55	2. 0	3. 0	70	115
Terrace escarpments, loamy								
Terrace escarpments, sandy								
Worthen cherty silt loam, 2 to 6 percent slopes	70	100	55	68	3. 0	3. 5	105	145
Worthen cherty silt loam, 6 to 12 percent slopes	65	95	50	65	3. 0	3. 5	100	140
Worthen cherty silt loam, 12 to 20 percent slopes	55	90	48	63	2. 8	3. 3	95	135
Worthen silt loam, 0 to 2 percent slopes	80	110	55	70	3. 2	3. 7	115	150
Worthen silt loam, 2 to 6 percent slopes	75	105	55	68	3. 0	3. 5	105	145
Worthen silt loam, 6 to 12 percent slopes	70	100	50	65	3. 0	3. 5	100	140

[1] Assumptions are that disease-resistant variety is planted and that weeds are controlled.
[2] Animal-unit-month. The number of animal units carried per acre multiplied by the number of days the pasture can be grazed, without injury to the sod, during a single grazing season.
[3] Assumptions are that area is adequately drained and protected from flooding.
[4] For years when the soil is not flooded.

The columns headed "B" show what yields can be expected under improved management. This level of management includes the following:

1. Testing the soils to determine fertilizer and lime requirements, and applying the amounts indicated.
2. Following a suitable cropping system.
3. Seeding, spraying, and cultivating at the appropriate times.
4. Planting hybrid corn at the rate of 16,000 to 18,000 plants per acre.
5. Using improved varieties of small grain.
6. Using a variety of alfalfa that is resistant to wilt and winterkill, applying enough lime to bring the pH to 6.5 or 7.0, topdressing annually with manure or with commercial fertilizer high in potash, cutting three times a year, and not using the fields for grazing in fall.

Even higher yields can be obtained from some soils through the use of more fertilizer and special management practices.

Use of the Soils as Woodland [2]

Originally, more than 80 percent of the land area of Vernon County was forested. Now about a third of the acreage, or 178,000 acres, is woodland. Most of this acreage is in farm woodlots and consists of soils too stony, too rocky, too rough, or too steep for farming. About 60 percent of the woodland has been heavily grazed, and nearly two-thirds is poorly stocked with trees.

Oak is predominant in the present stands. Northern red oak is twice as common as white oak. Other northern hardwoods, including maple, elm, basswood, and hickory, make up a substantial part of the woodland and are more common than oak in stream valleys. White pine and hemlock, minor components of the stands, are generally mixed with the northern hardwoods. Aspen, a pioneer species, grows in scattered stands throughout the county.

The principal woodland products are railroad ties, lumber, and fuelwood. Other products are veneer logs, fenceposts, cooperage bolts, and maple sirup. About two-thirds of the timber harvested is oak. The annual cut is nearly in balance with the annual growth.

Woodland groups

The soils of Vernon County have been grouped according to their capacity to produce woodland crops. In grouping the soils, consideration has been given to productivity, response to management, and the various factors that affect woodland management. Factors that affect management include hazards to the survival of seedlings, as well as the hazard of erosion, equipment limitations, the hazard of windthrow, species suitability, and the effects of soil-associated diseases, insects, and animals.

[2] By ROBERT E. GREENLAW, woodland conservationist, Soil Conservation Service, Madison, Wis.

The kind and quantity of wood products that can be grown in a given area largely determine the kind of management that is needed. Different soils are suitable for different kinds of trees and produce trees at different rates. Information given in the following descriptions of the woodland groups can be used along with other information in the soil survey to determine what kinds of trees grow best on particular soils and what kind of woodland management is advisable. The groups are numbered according to a statewide system. Groups 5, 6, and 8 are not represented in Vernon County, so they are not discussed in this survey. Unless the group contains only one soil, the soils are identified only by the name of the series. Listing of the series name does not necessarily mean that all the soils of that series are in the particular group. The "Guide to Mapping Units," at the back of this publication, gives the woodland group classification of each soil of the county.

One of the best indicators of the productivity of a soil for trees is the site index. Simply stated, site index refers to the average total height of the dominant trees in a stand at the age of 50 years. The site index can be used in conjunction with available tables of normal yields, supplied by research foresters, to make predictions of yields of woodland crops.

Site indexes for many of the soils of Vernon County have been determined from measurements made by a team of foresters and soil scientists. For the soils on which no measurements have been made, estimates of site quality were arrived at by making comparisons with soils on which measurements had been made.

WOODLAND GROUP 1

This group consists of soils of the Arenzville, Chaseburg, Dubuque, Fayette, Gale, Kickapoo, Norden, Norwalk, Palsgrove, Rockbridge, Rozetta, and Tell series. These soils are deep enough that roots develop well, and they have high fertility, good moisture-supplying capacity, and good internal drainage. They have the highest potential for production of timber of any soils in Vernon County, but since they are highly desirable for farming, only small isolated areas are used as woodland.

The native vegetation on these soils is mainly mixed oak. Northern red oak and white oak predominate. Basswood, maple, and hickory are the other major species. Aspen, a pioneer species, generally grows in areas that have been burned over. Bur oak generally grows on the eroded higher slopes and on the drier sites.

The average site index for red oak is 55 on Norden soils, 58 on Dubuque soils, and 67 on Fayette soils. It is about the same on slopes that face north as on slopes that face south, but it is lower on some ridgetops.

Regeneration of oak is poor. The supply of seed is usually adequate, but seeds and seedlings are destroyed by rodents and insects. The acorn weevil, probably the most destructive insect, sometimes infests as much as 90 percent of the acorn crop. Oaks will not regenerate after cutting unless the canopy is opened enough to admit a fair amount of light. Scarifying the soils also increases the likelihood that oaks will reproduce adequately. The other hardwoods require less light than oak and generally become established easily if the supply of seed is adequate.

Natural stands of white pine and Norway pine are not common in this county. These trees do well if planted on the soils of this group, if competition from brush, grass, and weeds is controlled. Scalping, furrowing, or clean tilling the site before planting helps to control the competition. Herbicides can be used effectively on some sites. Control of grass also reduces the hazard of damage by field mice and other rodents.

The best species for farm windbreaks are white pine, white spruce, and white-cedar. The use of equipment on these soils is limited only by temporary wetness of the soils caused by heavy rains or spring thaws. Heavy equipment used in logging can cause some compaction. Logging causes less damage in winter than at other times. Steep topography limits the use of machinery for planting trees and for controlling fires. Uphill skidding will reduce the risk of erosion.

There is a slight hazard of damage to young trees by frost, frost heaving, and drowning. The chance of damage by heat and drought is slight on northern and eastern slopes and moderate on southern and western slopes. The hazard of windthrow is slight. Damage from insects is generally moderate, but in grassy areas white grubs sometimes damage the roots of trees seriously. "Damping-off" fungi may damage seedlings of conifers locally, and white pine blister rust is a hazard where currants and gooseberries are prevalent. Locally, deer and rabbits cause severe damage to new seedlings.

WOODLAND GROUP 2

This group consists of soils of the Medary series. These soils are moderately well drained and deep.

The native vegetation on these soils is usually northern hardwoods. The principal forest products are sawlogs and fuelwood. The site quality is medium for both hardwoods and conifers.

Competition from grass, brush, and weeds is a severe hazard to the establishment of tree seedlings. The drying of roots during droughts is another cause of losses. In soddy areas, white grubs damage tree roots. Blister rust is a hazard to white pine in areas where currants and gooseberry bushes are concentrated. Frost heaving is common. The hazards of erosion and windthrow are slight. When the soils are wet, wheeled vehicles cause compaction and are likely to bog down. Tree planting frequently has to be delayed because of wetness.

The species to be favored in natural stands are maple, basswood, white ash, red oak, and white oak. White pine and white spruce are suitable for planting.

WOODLAND GROUP 3

This group consists of Terrace escarpments, loamy, and soils of the Dakota, Hixton, and Norden series. These are moderately deep and deep, well-drained, loamy and sandy soils.

The natural stands on these soils consist of aspen, paper birch, Norway pine, white pine, black oak, and bur oak. The principal forest products are pulpwood, fuelwood, and sawtimber.

These soils are poor for oak (site index 40 to 48), good for Norway pine (site index 65 to 75), and good for white pine, aspen, and jack pine. Seriously eroded areas are medium for jack pine and poor for all other species.

Frost is of little danger to seedlings on the soils. Damage from heat and drought is severe on eroded soils and on south-facing slopes and moderate on the other sites.

Competition from other plants is generally not serious, though a little brush grows on north-facing slopes. The limitations on the use of equipment for planting, harvesting, and fire control are those imposed by steep topography and a few stony areas. The windthrow hazard and the erosion hazard are slight.

Zimmerman pine moths, pine sawflies, and white grubs are the principal injurious insects. The hazard of insect damage is moderate to severe. Locally, oak wilt is a severe hazard. Rodents do a moderate amount of damage occasionally. Rabbits and deer do damage in local areas, especially to new plantations.

WOODLAND GROUP 4

This group consists of Terrace escarpments, sandy, and soils of the Boone and Sparta series. These soils are excessively drained.

The native forest on these soils consisted of northern pin oak, jack pine, Norway pine, and white pine. Brush, grass, and weeds are common on the steep and eroded sites.

Individual measurements of representative stands of oak on these soils show that the site index ranges from 35 to 45 but is generally about 40. Measurements indicate that the site index for pine is much higher than that for oak. The site index for Norway pine is 70 to 75, and the site index for jack pine is 60 to 65. Since yields of oak are low and the quality is poor, consideration should be given to converting oak stands to pine stands.

The species to be preferred for planting on the less sloping and less eroded areas is Norway pine. White pine can be underplanted in poor stands of oak.

Seedling mortality from heat and drought ranges from moderate on uneroded soils to severe on eroded soils. There is little danger to plantations from frost heaving. Larvae that feed on roots are the principal insect pests. Gophers occasionally do some damage. Tree diseases are not serious hazards. Windthrow and erosion are moderate hazards. Limitations on the use of equipment are those imposed by slope and a few stony areas.

WOODLAND GROUP 7

This group consists of soils of the Stronghurst series. These soils are somewhat poorly drained.

The native vegetation on these soils consisted mainly of aspen and mixed hardwoods. The principal forest products are sawtimber and fuelwood. The site quality is commonly medium for aspen and mixed hardwoods, medium for white pine, and good for balsam fir and white spruce.

Many hazards limit the establishment and growth of trees on these soils. The danger of drowning is moderate to severe unless surface drainage is provided. Competition from grass, sedges, and brush is severe. Blister rust is a serious threat to white pine if gooseberry and currant bushes grow nearby. Root rot is common. Rabbits and deer cause serious damage to trees locally, especially to trees in new plantations. The hazard of windthrow is severe. The danger of damage from heat or drought is slight, but frost may be a hazard in depressions. Erosion is not generally a hazard.

Using machinery to plant trees, harvest timber, and control fire is difficult. Machinery causes compaction and is apt to bog down during wet seasons.

White pine, maple, and red oak are the species generally to be favored in managing the natural stands. White spruce, white pine, and white-cedar are the species to be preferred for planting. Mounds or ridges are the best locations for planting trees. Re-establishing timber is difficult.

WOODLAND GROUP 9

This group consists of Alluvial land and soils of the Boaz, Ettrick, and Orion series. These are somewhat poorly drained to very poorly drained alluvial soils.

The site quality for hardwoods ranges from poor to good. Cottonwood grows well on the somewhat poorly drained soils.

The danger of damage from heat, drought, or frost is slight. The hazard of drowning is severe because of frequent flooding. Tall weeds and brush encroach on openings, and plant competition is severe. Insects ordinarily do little damage. The hazard of root rot and stem rot is moderate to serious. Beavers are not numerous now, but beaver dams can flood forests and cause serious damage. The windthrow hazard is only moderate, except where there is a high water table for a long time. Erosion is a hazard only along streambanks, where it occasionally does severe damage. The use of machinery can be hazardous on the somewhat poorly drained soils and is impractical on the poorly drained soils. Harvesting of timber can be done only when the soils are dry or frozen. In logging operations, it is desirable to maintain the original hardwood cover. Access to these areas for the purpose of controlling fire is usually difficult, but fires are rather infrequent.

Willows can be planted to protect streambanks. Otherwise, cottonwood is the only species suitable for planting.

WOODLAND GROUP 10

This group consists of Houghton muck. It is a very poorly drained organic soil.

The natural vegetation on this soil consists mainly of willows and sedges. Pulpwood is the only forest product of any consequence. The site quality ranges from poor to good, depending on variations in drainage caused by microrelief.

Many seedlings are killed by late frosts and by a high water table. The windthrow hazard is severe, so cutting should be limited. Planting by machine is not practical, and planting by hand is difficult. Willows may be planted to control wind erosion in areas used for crops.

WOODLAND GROUP 11

This group consists of Gullied land and Marsh, two land types that have very severe limitations for use as woodland. The native vegetation is limited to assorted small shrubs, grass, and scattered small trees. The potential for trees of any species is poor, but a cover of vegetation should be maintained to provide cover for wildlife and protection for the watershed.

WOODLAND GROUP 12

This group consists of soils of the Ashdale, Dodgeville, Downs, Dunbarton, Huntsville, Lawson, Lindstrom, Muscatine, Sogn, Tama, and Worthen series. These are medium-textured, well-drained to somewhat poorly drained soils.

The native vegetation on these soils consists of plants that commonly grow on prairies or in oak openings. No forest products of commercial importance are grown, although some fuelwood and fenceposts may be cut. Bur oak

and redcedar are the principal trees. The quality of the site is poor for all species.

Trees are planted for windbreaks, but otherwise these soils are generally not used for trees. Species suitable for windbreaks on the well-drained soils are white pine, white-cedar, Norway spruce, European larch, and redcedar. On somewhat poorly drained soils, the species to be preferred are white spruce, white-cedar, and cottonwood.

Trees that are planted need cultivation for the first 2 or 3 years to reduce the hazard of competition with weeds and grass and the hazard of damage by mice.

WOODLAND GROUP 13

This group consists of Stony colluvial land and Stony rock land. These land types are steep and stony, and the depth and texture of the soil material vary widely.

The native vegetation ranges from northern hardwoods—maple, basswood, and oak—on the cool, moist, north-facing and east-facing slopes to oak and hickory on the hot, dry, south-facing and west-facing slopes. Aspen is a pioneer species. The principal forest products are sawtimber and fuelwood.

Although these soils are productive, woodland management is limited by steepness and stoniness. On the deeper, medium-textured soils, productivity is generally very high, but on the thinner, coarse-textured soils, it is generally very low.

On slopes facing south and west, heat and drought cause moderate to severe damage to seedlings. On slopes facing north and east, they cause slight damage. Limitations on the use of equipment are severe. Access for fire control is difficult, and constructing firebreaks is usually impractical. Logging is difficult and requires special equipment. Tree planting can be done only by hand.

White pine is suitable for planting on the deeper soils on slopes facing north and east, and Norway pine on the shallower soils and on slopes facing south and west. Where the soil material is less than 18 inches deep over limestone, redcedar is the preferred species.

Estimated yields of woodland products

Table 2 shows estimates of annual acre yields of usable timber, by soil types. Omission of a soil type from the table indicates either that the soil is not suitable for trees or that data on which to base an estimate are not available. The estimates are expressed in board feet, Scribner rule. They represent average annual production in densely stocked, intensively managed stands, and it is assumed that trees cut are at optimum harvesting age. No deductions have been made for culls or defective trees. All material cut in thinning is assumed to be included. Unmanaged stands usually yield less.

TABLE 2.—*Estimated yields of wood products*

[In board feet per acre, Scribner rule. Dashes indicate that the soil type is not suitable for or is not used for the class of trees specified. Soil types not suitable for woodland and those for which no data are available are not listed]

Soil type and woodland group classification	Cool sites [1]		Hot sites [2]	
	Hardwoods	Conifers	Hardwoods	Conifers
	Bd. ft./acre	*Bd. ft./acre*	*Bd. ft./acre*	*Bd. ft./acre*
Alluvial land (9)	100	--	--	--
Alluvial land, wet (9)	150	--	--	--
Arenzville silt loam (1)	275	--	--	--
Boaz silt loam (9)	150	--	--	--
Boone loamy sand (4)	50	300	50	200
Chaseburg silt loam (1)	250	--	--	--
Dakota sandy loam (3)	--	500	--	--
Downs silt loam (12)	200	--	175	--
Dubuque silt loam (1)	175	500	125	400
Dubuque soils (1)	175	400	100	350
Ettrick silt loam (9)	100	--	--	--
Fayette silt loam, uplands (1)	250	600	200	500
Fayette silt loam, benches (1)	250	600	--	--
Fayette silt loam, valleys (1)	275	600	225	500
Gale silt loam (1)	150	500	100	400
Hixton loam (3)	100	500	50	400
Hixton soils (3)	100	500	50	400
Hixton sandy loam (3)	75	500	50	400
Kickapoo fine sandy loam (1)	250	--	--	--
Medary silt loam (2)	175	--	125	--
Norden fine sandy loam (3)	225	500	175	450
Norden loam (1)	250	550	200	500
Norden silt loam (1)	250	550	200	500
Norwalk silt loam (1)	150	--	--	--
Orion silt loam (9)	150	--	--	--
Orion silt loam, wet (9)	100	--	--	--
Palsgrove silt loam (1)	200	500	150	400
Rockbridge silt loam (1)	250	300	150	250
Rozetta silt loam, benches (1)	200	300	--	--
Sparta loamy sand (4)	--	450	--	--
Stony colluvial land (13)	100–250	200–400	50–100	100–300
Stony rock land (13)	100–250	200–400	50–100	100–300
Stronghurst silt loam (7)	175	--	--	--
Stronghurst silt loam, benches (7)	200	500	--	--
Tell silt loam (1)	200	500	--	--
Terrace escarpments, loamy (3)	175	350	--	200
Terrace escarpments, sandy (4)	50	250	--	--

[1] North- and east-facing slopes, coves, and narrow valleys protected from heat and from drying winds.

[2] South- and west-facing slopes and ridgetops exposed to heat and to drying winds.

Engineering Uses of the Soils [3]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The properties most important to engineers are permeability to water, shear strength, compaction characteristics, drainage, shrink-swell characteristics, grain size, plasticity, and reaction. Depth to the water table, depth to bedrock or to sand and gravel, and topography also are important.

The information in this publication can be used to—

1. Make studies that will aid in selecting and developing industrial, business, residential, and recreational sites.

[3] Prepared in cooperation with the State Highway Commission of Wisconsin, Bureau of Public Roads, and the Soil Survey Division of Wisconsin Geological and Natural History Survey.

2. Make preliminary estimates of the engineering properties of soils in planning agricultural drainage systems, farm ponds, irrigation systems, and diversion terraces.
3. Make preliminary evaluations that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected locations.
4. Locate probable sources of gravel and other construction material.
5. Correlate performance with soil mapping units to develop information that will be useful in planning engineering practices and in designing and maintaining engineering structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement other published information, such as maps, reports, and aerial photographs, that is used in preparation of engineering reports for a specific area.
8. Develop other preliminary estimates for construction purposes.

With the soil map for identification of soil areas, the engineering interpretations reported here can be useful for many purposes. It should be emphasized, however, that these interpretations may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depth of layers here reported.

Some of the terms used by soil scientists have a special meaning in soil science that may not be familiar to engineers. These terms are defined in the Glossary.

Engineering classification systems

Most highway engineers classify soil material in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system all soil material is classified in seven principal groups. The classification is based on gradation, liquid limit, and plasticity index. The groups range from A-1, which consists of soils that have the highest bearing capacity, to A-7, which consists of soils that have the lowest strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group

TABLE 3.—*Engineering*

[Tests performed by State Highway Commission of Wisconsin in cooperation with the U.S. Department of Commerce, Bureau of

Soil name and location of sample	Parent material	Depth from surface	Horizon	Moisture-density data[1]	
				Maximum dry density	Optimum moisture
		In.		*Lb./cu. ft.*	*Pct.*
Arenzville silt loam:					
NE¼NW¼SW¼ sec. 31, T. 14 N., R. 3 W. (Modal profile.)	Silty alluvium.	7-24	A1	104	19
		30-36	A1b	89	28
NE¼NW¼SW¼ sec. 31, T. 14 N., R. 3 W.	Silty alluvium.	4-36	A1	----------	----------
		40-60	A1b	----------	----------
Center of NW¼ sec. 9, T. 13 N., R. 2 W.	Silty alluvium.	26-31	A1	----------	----------
Downs silt loam:					
NE¼NW¼SW¼ sec. 5, T. 13 N., R. 4 W.	Silt over bedrock.	0-11	A	97	21
		20-30	B2	107	19
		41-60	C	109	19
SW¼NE¼SE¼ sec. 33, T. 14 N., R. 4 W. (Modal profile.)	Silt over bedrock.	0-11	A	103	19
		20-29	B2	105	19
		38-20	C	119	13
Fayette silt loam:					
Center of NE¼ sec. 17, T.12 N., R.3 W. (Modal profile.)	Silt over bedrock.	15-28	B2	108	16
		40-60	C	111	16
SW¼SE¼ sec. 6, T.14 N., R.5 W.	Silt over bedrock.	24-38	B2	----------	----------
		50-60	C	----------	----------
North center edge of NW¼NW¼ sec. 36, T.14 N., R.3 W.	Silt over bedrock.	20-34	B2	----------	----------
		48-60	C	----------	----------

[1] Based on AASHO Designation: T 99-57, Method A (*1*).

[2] According to AASHO Designation: T 88 (*1*). Results obtained by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine

index number. The numbers range from 0, for the best material, to 20, for the poorest. The group index number is shown in parentheses following the soil group symbol.

Some engineers prefer to use the Unified classification system (*6*). In this system soils are identified according to texture and plasticity and performance as engineering construction material. They are identified as coarse grained (eight classes), fine grained (six classes), and highly organic (one class).

The textural classification used by the U.S. Department of Agriculture (*4*) is primarily for agricultural use but is also important in engineering. In this system the classification of a soil depends on the proportions of sand, silt, and clay particles.

Table 3 shows the AASHO and Unified classifications of specified soils in the county, as determined by laboratory tests. Table 4 shows the estimated classification of all the soils in the county according to all three systems.

Engineering test data

Samples of three kinds of soil in the county were tested in accordance with standard procedures to help evaluate the soils for engineering purposes. Two of the soil types were sampled at three different locations, and the other was sampled at two different locations. Not all of the major horizons in each soil were sampled. The tests were made by the State Highway Commission of Wisconsin in cooperation with the Bureau of Public Roads. The results of these tests are given in table 3.

Estimated engineering properties

Estimates of soil properties that are significant in engineering are given in table 4. The estimates are for undisturbed soil. They are based on data shown in table 3, on test data from similar soils in other counties, on comparison with similar soils that have been tested, and on study of the soils in the field. Detailed profile descriptions are given in the section "Formation and Classification of the Soils," and information on the range of properties of the soils, in the section "Descriptions of the Soils."

The column headed "Permeability" in table 4 indicates the rate at which water moves through a saturated soil horizon. The estimates are in inches per hour. They are based largely on soil texture, structure, and consistence.

test data

Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis[2]							Liquid limit	Plasticity index	Classification	
Percentage passing sieve—			Percentage smaller than—						AASHO	Unified[3]
No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0. 05 mm.	0. 02 mm.	0. 005 mm.	0. 002 mm.				
							Pct.			
----------	100	96	88	50	17	9	32	10	A-4(8)	ML-CL
100	98	96	89	53	17	10	47	12	A-7-5(10)	ML
100	98	71	65	36	12	8	26	6	A-4(7)	ML-CL
100	96	49	43	23	9	6	34	11	A-6(3)	SC
----------	100	89	83	54	22	16	34	12	A-6(9)	ML-CL
----------	100	99	95	66	31	23	36	9	A-4(8)	ML
----------	----------	100	96	64	33	28	38	15	A-6(10)	ML-CL
----------	----------	100	97	64	30	25	37	13	A-6(9)	ML-CL
----------	100	98	95	65	31	23	35	10	A 4(8)	ML-CL
----------	100	99	96	67	35	29	40	14	A-6(10)	ML-CL
100	99	83	81	57	27	19	26	8	A-4(8)	CL
----------	100	97	94	69	36	31	46	23	A-7-6(14)	CL
----------	100	98	94	67	30	25	36	15	A 6(10)	CL
100	99	97	94	70	37	31	45	23	A-7-6(14)	CL
100	99	95	92	64	30	25	36	15	A-6(10)	CL
100	98	88	86	60	33	27	39	17	A-6(11)	CL
100	99	92	90	64	25	20	32	12	A-6(9)	CL

material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The data used in this table are not suitable for naming textural classes for soils.

[3] SCS and BPR have agreed that a soil having a plasticity index within 2 points of the A-line is to be given a borderline classification. ML-CL is a borderline classification arrived at on this basis.

TABLE 4.—*Measured and estimated engineering properties of the soils*

Soil series and map symbols	Depth from surface	Classification			Percentage passing sieve [1]—			Permeability	Available water capacity	Reaction	Shrink-swell potential
		USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
	In.							*In./hr.*	*In./in.*	*pH*	
Alluvial land (Ad, Al). No estimates of properties.											
Arenzville (Ar).	0–4	Silt loam	ML–CL	A–4	100	100	95	0. 8–2. 5	0. 22	6. 6–7. 3	Low.
	4–40	Silt loam	ML	A–7	100	100	95	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	40–60	Silt loam	ML	A–4	100	100	95	0. 2–0. 8	. 20	6. 6–7. 3	Low.
Ashdale (AsB2, AsC2, AsD2, AsD3).	0–25	Silt loam	ML	A–7	100	100	100	0. 8–2. 5	. 24	5. 6–6. 5	Moderate.
	25–40	Silty clay loam to silty clay.	ML–CL	A–7	95	95	95	0. 2–0. 8	. 20	5. 6–6. 0	Moderate.
	40–55	Clay	CH	A–7	95	95	90	0. 05–0. 2	. 16	5. 6–6. 0	High.
	55+	Dolomite									
Boaz (Bo).	0–36	Silt loam	ML–CL	A–4	100	100	95	0. 1–0. 5	. 20	5. 6–6. 5	Moderate.
	36–42	Silty clay loam	MH	A–7	100	100	95	0. 8–2. 5	. 20	5. 6–6. 0	Moderate.
	42–60	Silty clay	MH	A–7	100	100	100	0. 2–0. 8	. 18	5. 1–6. 0	Moderate.
Boone (BsE, BsF).	0–4	Loamy sand	SM	A–3	100	60	15	5. 0–10. 0	. 07	5. 1–5. 5	Very low.
	4–25	Sand	SP–SM	A–3	95	55	5	>10. 0	. 06	5. 1–6. 0	Very low.
	25+	Sandstone						5. 0–10. 0	. 04	5. 6–6. 0	Very low.
Chaseburg (CaA, CaB, CaC).	0–28	Silt loam	ML	A–4	100	95	90	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	28–35	Silt loam	ML–CL	A–4	100	95	90	0. 8–2. 5	. 18	6. 0–6. 5	Low.
	35–60	Silt loam	ML	A–4	95	100	85	0. 2–0. 8	. 18	5. 6–6. 5	Low.
Dakota (DaA, DaB, DaB2, DaC2).	0–12	Sandy loam	SM	A–2–4	100	100	35	2. 5–5. 0	. 16	6. 6–7. 3	Low.
	12–34	Sandy loam	SM	A–2–4	100	100	30	2. 5–5. 0	. 12	6. 6–7. 3	Low.
	34–60	Fine sand	SP	A–3	95	95	5	5. 0–10. 0	. 04	6. 1–6. 5	Very low.
Dodgeville (DdD2).	0–14	Silt loam	ML	A–7	100	100	100	0. 8–2. 5	. 24	6. 1–6. 5	Moderate.
	14–18	Silty clay loam	ML	A–7	100	100	100	0. 2–0. 8	. 20	5. 6–6. 0	Moderate.
	18–60	Silty clay to clay.	CH	A–7	95	95	90	0. 05–0. 2	. 16	5. 6–6. 0	High.
Downs (DmA, DmB, DmB2, DmC2, DmD2). For Tama component, see Tama series.	0–14	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 22	6. 1–7. 3	Low.
	14–45	Heavy silt loam to silty clay loam.	ML–CL	A–7	100	100	100	0. 8–2. 5	. 20	5. 6–6. 0	Moderate.
	45–60	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 18	5. 6–6. 0	Low.
Dubuque (DsB, DsB2, DsC, DsC2, DsD, DsD2, DsE, DsE2, DsF, DtC3, DtD3, DtE3, DuB, DuB2, DuC2, DuD2). For Gale component of units DuB, DuB2, DuC2, and DuD2, see the Gale series.	0–12	Silt loam	ML–CL	A–4	100	100	95	0. 8–2. 5	. 20	6. 1–7. 3	Low.
	12–16	Silty clay loam	ML–CL	A–6	100	100	95	0. 2–0. 8	. 18	5. 6–6. 0	Moderate.
	16–36	Clay	CH	A–7	90	70	60	0. 05–0. 2	. 16	5. 1–6. 5	High.
	36+	Dolomite									
Dunbarton (DvD, DvE). For Sogn component, see Sogn series.	0–10	Silt loam	ML–CL	A–5	100	100	95	0. 8–2. 5	. 20	6. 1–7. 3	Low.
	10–12	Silty clay loam	ML–CL	A–6	100	100	95	0. 2–1. 8	. 18	5. 6–6. 0	Moderate.
	12–18	Silty clay	MH–CH	A–7	90	70	60	0. 05–0. 2	. 16	5. 1–6. 5	High.
	18+	Dolomite									
Ettrick (Et).	0–7	Silt loam	ML	A–4	100	100	100	2. 5–5. 0	. 24	6. 6–7. 3	Low.
	7–36	Silty clay loam	CH	A–7	100	100	95	0. 8–2. 5	. 20	6. 6–7. 3	Moderate.
	36–60	Silt loam	ML	A–4	100	100	100	0. 2–0. 8	. 18	6. 6–7. 3	Low.

See footnotes at end of table.

TABLE 4.—*Measured and estimated engineering properties of the soils*—Continued

Soil series and map symbols	Depth from surface	Classification			Percentage passing sieve [1]—			Permeability	Available water capacity	Reaction	Shrink-swell potential
		USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
	In.							*In./hr.*	*In./in.*	*pH*	
Fayette (FaA, FaB, FaB2, FaC2, FuB, FuB2, FuC, FuC2, FuD, FuD2, FuD3, FuE, FuE2, FvC, FvC2, FvD, FvD2, FvE, FvE2, FvF).	0–9	Silt loam	ML–CL	A–6	100	100	100	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	9–42	Silty clay loam to heavy silt loam.	MH	A–7	100	100	100	0. 8–2. 5	. 18	5. 6–6. 5	Moderate.
	42–60	Silt loam	CL	A–6	100	100	100	0. 2–0. 8	. 18	5. 6–6. 5	Low.
Gale (GaB2, GaC2, GaD2, GaE, GaE2, GaF).	0–19	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	19–29	Silty clay loam	MH	A–7	100	100	95	0. 8–2. 5	. 18	5. 6–6. 5	Moderate.
	29–48	Fine sand	SP	A–3	100	100	5	5. 0–10. 0	. 04	5. 6–6. 0	Very low.
	48+	Weathered sandstone.									
Gullied land (Gu). No estimates of properties.											
Hixton (HIC2, HID2, HIE2, HsC2, HsD2, HsE, HsE2, HtF).	0–7	Loam	ML	A–4	100	100	60	0. 8–2. 5	. 16	4. 6–5. 5	Moderate.
	7–26	Loam	ML	A–4	100	100	60	0. 8–2. 5	. 14	4. 6–5. 5	Moderate.
	26–60	Fine sand	SM–SP	A–3	90	90	5	5. 0–10. 0	. 04	5. 1–5. 5	Very low.
Houghton (Hu).	0–60	Muck and peat	Pt	[2]	[2]	[2]	[2]	2. 5–5. 0	>. 20	[2]	Moderate.
Huntsville (Hv).	0–29	Silt loam	CL	A–4	100	100	95	0. 8–2. 5	. 24	6. 6–7. 3	Low.
	29–36	Loam	ML–CL	A–6	100	100	95	0. 8–2. 5	. 22	6. 6–7. 3	Low.
	36–60	Loam	ML–CL	A–6	100	95	80	0. 8–2. 5	. 22	6. 6–7. 3	Low.
Kickapoo (Kp).	0–14	Fine sandy loam	SM	A–2	100	90	30	2. 5–5. 0	. 14	6. 6–7. 3	Low.
	14–36	Fine sandy loam	SM	A–4	100	100	40	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	36–60	Silt loam to sand	SM	A–4	100	100	40	0. 8–2. 5	. 20	6. 6–7. 3	Low.
Lawson (Ls).	0–24	Silt loam	ML	A–4	100	100	100	0. 8–2. 5	. 24	6. 6–7. 3	Low.
	24–48	Loam	CL–ML	A–4	100	100	95	0. 2–0. 8	. 20	6. 6–7. 3	Low.
	48–60	Silt loam	ML–CL	A–4	100	95	80	0. 2–0. 8	. 18	6. 6–7. 3	Low.
Lindstrom (LtC2, LtD2, LtE2).	0–21	Silt loam	ML	A–4	100	100	95	0. 8–2. 5	. 24	6. 6–7. 3	Low.
	21–50	Silt loam	ML	A–4	100	100	95	0. 8–2. 5	. 18	5. 1–6. 5	Low.
	50–60	Silt loam	ML	A–4	100	100	100	0. 2–0. 8	. 16	6. 1–6. 5	Low.
Marsh (Ma). No estimates of properties.											
Medary (MeA, MeB2).	0–7	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 20	5. 6–6. 5	Low.
	7–14	Silty clay loam	MH	A–7	100	100	95	0. 2–0. 8	. 18	5. 1–5. 5	Moderate.
	14–60	Silty clay	CH	A–7	100	100	95	0. 05–0. 2	. 18	5. 1–5. 5	High.
Muscatine (MuA, MuB).	0–15	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 24	6. 1–7. 3	Low.
	15–42	Silty clay loam	CH	A–7	100	100	100	0. 2–0. 8	. 20	5. 6–6. 5	Moderate.
	42–48	Silty clay loam	CH	A–7	100	100	90	0. 2–0. 8	. 18	6. 1–6. 5	Moderate.
	48–60	Stratified silt and sand.	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3].
Norden (NfD2, NfE, NfE2, NfF, NIC2, NID, NID2, NIE, NIE2, NoB2, NoC2, NoD, NoD2, NoE, NoE2, NoF).	0–17	Silt loam	ML–CL	A–4	100	100	90	0. 8–2. 5	. 20	6. 1–6. 5	Low.
	17–34	Silty clay loam	MH	A–7	100	100	90	0. 8–2. 5	. 18	5. 6–6. 5	Moderate.
	34–40	Sandy clay loam.	CL	A–6	100	100	60	0. 8–2. 5	. 14	5. 6–6. 0	Low.
	40+	Sandstone									
Norwalk (NwB2, NwC2, NwD2).	0–20	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 20	6. 6–7. 8	Low.
	20–26	Silty clay loam	ML–CL	A–7	100	100	95	0. 2–0. 8	. 18	5. 1–5. 5	Moderate.
	26–40	Silty clay or clay	CH	A–7	100	100	85	0. 2–0. 8	. 18	5. 1–5. 5	High.
	40+	Cherty dolomite									

See footnotes at end of table.

TABLE 4.—*Measured and estimated engineering properties of the soils*—Continued

Soil series and map symbols	Depth from surface	Classification			Percentage passing sieve [1]—			Permeability	Available water capacity	Reaction	Shrink-swell potential
		USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
	In.							*In./hr.*	*In./in.*	*pH*	
Orion (Or, Ow).	0–8	Silt loam	ML	A–4	100	100	100	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	8–48	Silt loam	ML	A–4	100	100	100	0. 2–0. 8	. 18	6. 6–7. 3	Low.
	48–60	Silt loam	ML	A–4	100	100	95	0. 2–0. 8	. 18	6. 6–7. 8	Low.
Palsgrove (PaB, PaB2, PaC, PaC2, PaD, PaD2, PaD3, PaE, PaE2).	0–15	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 20	5. 6–7. 3	Low.
	15–35	Silty clay loam	ML–CL	A–6	100	100	100	0. 2–0. 8	. 18	5. 6–6. 0	Moderate.
	35–42	Clay	CH	A–7	90	70	60	0. 05–0. 2	. 16	5. 6–6. 0	High.
	42+	Dolomite									
Rockbridge (RbC2, RbD2).	0–8	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 20	5. 6–7. 3	Low.
	8–35	Silty clay loam	CL	A–7	100	100	95	0. 8–2. 5	. 18	5. 6–7. 0	Moderate.
	35–60	Gravelly loam	GC	A–1	50	45	20	5. 0–10. 0	. 04	4. 6–5. 0	Very low.
Rozetta (RoA, RoB).	0–21	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 20	6. 1–6. 5	Low.
	21–41	Silty clay loam	MH	A–7	100	100	100	0. 2–0. 8	. 18	5. 1–6. 0	Moderate.
	41–60	Silt loam	ML	A–4	100	100	100	0. 2–0. 8	. 18	5. 8–6. 0	Low.
Sogn.	0–12	Silt loam	ML–CL	A–4	100	96	95	0. 8–2. 5	. 24	7. 3–7. 8	Low.
	12+	Dolomite									
Sparta (SaA, SaB2, SaC2).	0–17	Loamy sand	SM	A–2–4	100	100	15	5. 0–10. 0	. 08	5. 1–6. 0	Low.
	17–22	Sand	SP–SM	A–3	100	95	10	5. 0–10. 0	. 06	5. 6–6. 5	Very low.
	22–60	Fine sand	SP	A–1	95	90	10	>10. 0	. 04	6. 1–6. 5	Very low.
Stony colluvial land (ScB, ScC). No estimates of properties.											
Stony rock land (SkE, SkF). No estimates of properties.											
Stronghurst (StB2, StC2, SuA, SuB).	0–8	Silt loam	ML	A–4	100	100	100	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	8–40	Heavy silt loam to silty clay loam.	CL	A–7	100	100	100	0. 2–0. 8	. 18	5. 1–6. 5	Moderate.
	40–60	Silt loam	ML	A–4	100	100	100	0. 8–2. 5	. 16	6. 6–7. 3	Low.
Tama (TaA, TaB, TaC2).	0–16	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 22	7. 3–7. 8	Low.
	16–45	Heavy silt loam to silty clay loam.	ML–CL	A–7	100	100	100	0. 8–2. 5	. 20	5. 1–6. 5	Moderate to high.
	45–60	Silt loam	ML–CL	A–4	100	100	100	0. 2–0. 8	. 18	5. 6–6. 0	Low.
Tell (TeB2, TeC2, TeD2).	0–12	Silt loam	ML–CL	A–4	100	100	100	0. 8–2. 5	. 20	6. 6–7. 3	Low.
	12–35	Silty clay loam	ML–CL	A–7	100	100	95	0. 8–2. 5	. 18	5. 1–6. 5	Moderate.
	35–60	Sand	SP	A–3	100	100	5	5. 0–10. 0	. 04	5. 1–6. 0	Very low.
Terrace escarpments (Tr, Ts). No estimates of properties.											
Worthen (WcB, WcC, WcD, WoA, WoB, WoC).	0–60	Silt loam	ML–CL	A–4	100	100	95	0. 8–2. 5	. 20	5. 6–7. 3	Low.

[1] Averages; the values range from about 5 percent less to 5 percent more than the figures shown.
[2] Not determined.
[3] Variable.

The estimate for the entire profile is generally the same as that for the least permeable layer in the profile.

The column headed "Available water capacity" gives estimates of the amount of water that a soil can hold in a form available to plants. It is the difference between the amount of water in the soil at field capacity (approximately one-third atmosphere of moisture tension for silty and clayey soils and one-tenth atmosphere for sandy soils) and the amount at the time plants wilt (approximately 15 atmospheres).

Reaction, which refers to the degree of acidity or alkalinity of a soil, is expressed in pH values. The degrees of acidity or alkalinity are described under "Reaction" in the Glossary. A knowledge of pH value is important in determining the need for lime, the hazard of corrosion to metal conduits, and the risk of deterioration of cement tile.

The column headed "Shrink-swell potential" shows the volume change to be expected of the soil material with changes in moisture content. The potential is based on volume-change tests or on observable physical properties of the soils. It is affected by the amount of organic matter and by the amount and kind of clay. Soils in which illite clays are predominant, for example, have a lower shrink-swell ratio than soils in which montmorillonite clays are predominant.

Engineering interpretations

In table 5 are interpretations of the suitability of the soils as a source of topsoil and of sand and gravel; the kind and estimated degree of limitation of the soils as subgrades for highways, as support for foundations, and as filter fields or seepage beds for sewage disposal; and the soil features or characteristics that are likely to affect various engineering practices.

The suitability of a soil as a source of topsoil and of sand and gravel is described as good, fair, poor, or unsuitable.

The limitation of a soil for subgrades, foundations, and sewage disposal is described as slight, moderate, severe, and very severe. Slight means there are no limitations or there are limitations, for the given use, that are easy to overcome. Moderate means that the limitations, for the given use, can be overcome by average management and soil manipulation. Severe means that the limitations, for the given use, are difficult to overcome. Very severe means that the limitations generally preclude the use of the soil for the given purpose.

Topsoil or sand and gravel.—Topsoil refers to soil material that is used to topdress roadbanks, parks, gardens, and lawns. In certain parts of the county, the suitability of subsoil material as topsoil should be considered. For example, in areas where loamy topsoil is in great demand, both the surface layer and the subsoil can be removed from a medium-textured loessal soil. If properly treated with fertilizer and amendments, the loamy subsoil material serves adequately as topsoil.

There are places in the county where sand or gravel is within a depth of 5 feet. Some of this coarse-textured material, however, contains an appreciable amount of finer textured material. To determine its suitability as a source of sand and gravel, it is necessary to take samples from individual test pits and test them in the laboratory.

Highway subgrade.—The estimated degrees of limitation for use as subgrade for highways are based mainly on interpretations of test data for representative soils. The surface soil generally is not suitable as subgrade material, because of its high organic-matter content. The degree to which the subgrade material is affected by such factors as surface drainage and depth of frost penetration has to be determined for each individual site.

Foundations for low buildings.—The limitations of an undisturbed soil for use as support for low buildings depend mainly on bearing capacity and expansion potential. The evaluations in table 5 relate to the substratum, because the base of the foundation has to be below the depth at which the soil is subject to the seasonal volume change caused by alternate wetting and drying, and below the depth at which the soil structure is significantly weakened by root holes and animal burrows. Also, in the cool, humid climate of Vernon County, the base of the foundation has to be below the depth at which the soil is affected by frost heaving. Slope and erosion are local factors and were not considered in the estimates given in table 5.

Sewage disposal.—The degree of limitation of a soil for sewage disposal indicates the ability of the soil to absorb sewage and dispose of it without contaminating surrounding areas.

Limitations for installations such as filter fields, seepage beds, and, to a lesser extent, seepage pits, for the disposal of effluent from septic tanks are considered in the evaluations in table 5. A severe limitation indicates the need for onsite investigation and appropriate tests. A very severe limitation indicates generally that the soil is unsuitable for the absorption of domestic sewage effluent.

How well a sewerage system works depends largely on the rate at which the septic tank effluent moves into and through the soil. Permeability should be moderate to rapid, and the percolation rate at least 1 inch per hour.

Among the factors that affect the limitations of a soil for sewage systems are structural stability, depth, the nature of the underlying material, susceptibility to overflow, slope, nearness to streams and lakes, and depth to the water table.

A well-developed structure that is stable when the soil is wet greatly improves the value of the soil for sewage disposal. If the structure is unstable, the soil slakes down when wet, thereby retarding permeability and infiltration and permitting movement of soil separates into tile pipes or onto the prepared gravel bed.

A water table that rises as high as the subsurface tile forces sewage effluent to the surface. As a result, an ill-smelling, unwholesome bog forms in the filter field. In most soils, 4 feet of soil material between the bottom of the trench or filter bed and either the highest level of the water table or indurated rock is adequate for filtering and purifying the effluent from septic tanks.

Where the slope is more than 10 percent, filter fields are difficult to lay out and construct and seepage beds are impractical. Where the slope is very steep, the effluent is likely to flow laterally and seep out on the surface.

A shallow seepage pit may prove satisfactory if the material is coarse textured, deep, and free draining. A deep pit can be used if the soil material is slowly or very slowly permeable in the uppermost few feet but has a rapidly permeable substratum and a low water table.

TABLE 5.—*Engineering*

Soil and map symbols	Suitability as source of—		Degree of limitation for—		
	Topsoil	Sand and gravel	Highway subgrade [1]	Foundations for low buildings	Sewage disposal
Alluvial land (Ad, Al) Needs onsite investigation.					
Arenzville (Ar)	Surface layer good. Subsoil fair: thick. Material unobtainable at times because of occasional flooding.	Unsuitable	Severe: substratum has very low stability and very low bearing capacity when wet.	Moderate to severe: liquifies easily and flows as a viscous fluid; highly susceptible to frost heave and subsequent loss of strength; fair shear strength; low compressibility.	Severe: occasional flooding. Filter fields will not function when flooded.
Ashdale (AsB2, AsC2, AsD2, AsD3).	Surface layer good: dark colored; thick. Subsoil poor: clayey.	Unsuitable	Severe in subsoil and upper substratum; high plasticity; high shrink-swell potential; elasticity. Slight in lower substratum: dolomite.	Moderate: clay residuum has high shrink-swell potential, poor shear strength, and very high compressibility.	Slight where layer of clay is thick enough and permeable enough to absorb effluent.
Boaz (Bo)	Surface layer good. Subsoil poor to fair.	Poor: substratum contains some poorly graded sand with silt lenses.	Very severe in subsoil: elasticity. Severe in substratum: generally unstable; moderate shrink-swell potential. Flooding common.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; low cohesion when wet causes settlement; fair shear strength; liquifies easily.	Severe: fluctuating water table; flooding common.
Boone (BsE, BsF)	Unsuitable: droughty and erosive.	Fair for sand	Moderate in upper substratum: lacks cohesiveness when dry. Slight in lower substratum: sandstone.	Slight: sand has good shear strength.	Moderate where layer of sandstone residuum is thick; possible contamination of ground water.
Chaseburg (CaA, CaB, CaC).	Surface layer good. Subsoil fair: thick. Material unobtainable at times because of occasional flooding.	Unsuitable	Severe in substratum: very low stability and very low bearing capacity when wet.	Moderate to severe: liquifies easily and may flow if saturated; highly susceptible to frost heave and subsequent loss of bearing strength.	Severe: occasional flooding. Filter fields will not function when flooded.
Dakota (DaA, DaB, DaB2, DaC2).	Surface layer fair: thick; droughty. Subsoil poor to fair: thin over sand.	Fair for sand: poorly graded sand in substratum.	Slight in subsoil: high stability when wet. Slight in substratum: stable when damp; lacks cohesiveness when dry.	Slight: good shear strength; very low compressibility; may liquify and flow if saturated.	Slight: free flowing at a depth of approximately 30 inches.
Dodgeville (DdD2)	Surface layer good: dark colored; thick. Subsoil unsuitable to poor: clayey.	Unsuitable	Severe in subsoil and upper substratum: high plasticity; high shrink-swell potential; elasticity. Slight in lower substratum: dolomite.	Moderate: clay residuum has high shrink-swell potential; poor shear strength; very high compressibility.	Severe: clayey subsoil; probable contamination of ground water.

See footnote at end of table.

interpretations

Corrosion potential		Soil features affecting—					
Metal	Concrete	Farm ponds: Reservoir	Farm ponds: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Low	Low	Pervious	Semipervious when compacted; medium to low stability; low shrink-swell potential.	Moderate permeability; occasional flooding.	Moderate water-intake rate; moderate water-holding capacity; occasional flooding.	Most features favorable for diversions. Level relief; no erosion hazard.	Most features favorable.
Low	High	Pervious	Semipervious when compacted; medium stability; moderate shrink-swell potential in subsoil; low stability and high shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Some slopes of more than 12 percent.
Low	Low to moderate.	Semipervious	Semipervious when compacted; medium stability; moderate shrink-swell potential; piping hazard.	Moderate to slow permeability; flooding common.	Slow to moderate water-intake rate; moderate water-holding capacity; somewhat poor natural drainage; flooding common.	Flooding common; somewhat poor natural drainage; wetness may hinder construction.	Somewhat poor natural drainage; wetness may hinder construction.
Low	Low	Very pervious; too porous to hold water.	Very pervious when compacted; high stability.	Excessive natural drainage.	Very rapid water-intake rate; very low water-holding capacity; wind erosion hazard.	Erosion hazard; vegetation difficult to establish.	Vegetation difficult to establish and maintain.
Low	Low	Pervious	Semipervious when compacted; high stability.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity; occasional flooding.	Most features favorable for diversions.	Most features favorable.
Low	Low	Very pervious	Pervious when compacted; high stability; piping hazard.	Adequate natural drainage.	Rapid water-intake rate; moderate to low water-holding capacity.	Sandy texture; erosion hazard.	Vegetation difficult to establish and maintain.
Low to moderate.	Low	Pervious; shallow to bedrock.	Semipervious when compacted; medium to low stability; high shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Bedrock may hinder construction.	Seedbed difficult to prepare where slope is more than 12 percent.

TABLE 5.—*Engineering*

Soil and map symbols	Suitability as source of—		Degree of limitation for—		
	Topsoil	Sand and gravel	Highway subgrade [1]	Foundations for low buildings	Sewage disposal
Downs (DmA, DmB, DmB2, DmC2, DmD2). For Tama component, see Tama series.	Surface layer good: thick. Subsoil poor to fair, depending on clay content: thick.	Unsuitable	Severe: low bearing capacity; high shrink-swell potential.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; low cohesion when wet causes settlement; moderate compressibility; moderate shear strength.	Slight: moderate permeability.
Dubuque (DsB, DsB2, DsC, DsC2, DsD, DsD2, DsE, DsE2, DsF, DtC3, DtD3, DtE3, DuB, DuB2, DuC2, DuD2). For Gale component of DuB, DuB2, DuC2, and DuD2, see Gale series.	Surface layer good. Upper subsoil poor to fair: thin. Lower subsoil unsuitable: clayey.	Unsuitable	Severe in subsoil and upper substratum: high plasticity; high shrink-swell potential; elasticity. Slight in lower substratum: dolomite.	Slight where footings are on bedrock. Very severe where footings are in clay residuum. Clay residuum has high shrink-swell potential; poor shear strength; very high compressibility.	Severe: clayey subsoil; possible contamination of ground water through fractured bedrock.
Dunbarton (DvD, DvE). For Sogn component, see Sogn series.	Surface layer good. Subsoil fair.	Unsuitable	Severe: high shrink-swell potential in subsoil; high plasticity.	Slight: shallow to bedrock.	Very severe: shallow to bedrock; probable contamination of ground water.
Ettrick (Et)	Surface layer good. Subsoil poor to fair: high water table; flooding.	Unsuitable	Severe in subsoil and substratum; high plasticity; moderate shrink-swell potential; elasticity.	Severe: high compressibility; fair shear strength; high water table; moderate shrink-swell potential.	Very severe: high water table.
Fayette:					
Silt loam, benches (FaA, FaB, FaB2, FaC2).	Surface layer good. Subsoil poor to fair: thick; lower part sandy in places.	Fair: substratum contains some poorly graded sand with silt lenses.	Severe in subsoil: elasticity; moderate shrink-swell potential. Severe in substratum: unstable.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; low cohesion when wet causes settlement; fair shear strength; liquifies easily.	Slight: possible infiltration of silt into drain pipes and gravel beds.
Silt loam, uplands, and silt loam, valleys (FuB, FuB2, FuC, FuC2 FuD, FuD2, FuD3, FuE, FuE2, FvC, FvC2, FvD, FvD2, FvE, FvE2, FvF).	Surface layer good. Subsoil poor to fair: clayey.	Unsuitable	Severe in subsoil: high plasticity; high shrink-swell potential. Severe in substratum: moderate shrink-swell potential; low bearing capacity.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; low cohesion when wet causes settlement; moderate compressibility; moderate shear strength.	Moderate: moderate permeability.
Gale (GaB2, GaC2, GaD2, GaE, GaE2, GaF).	Surface layer good. Subsoil poor to fair: lower part sandy in many places.	Fair: substratum contains poorly graded sand; bedrock weakly cemented.	Moderate in subsoil: low bearing capacity. Slight in substratum. Lacks cohesiveness when dry.	Slight: very low compressibility; may liquify and flow if excavated below water table.	Moderate: bedrock near surface in places.

See footnote at end of table.

interpretations—Continued

Corrosion potential		Soil features affecting—						
Metal	Concrete	Farm ponds: Reservoir	Farm ponds: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Low	Low	Pervious	Semipervious when compacted; medium stability; high shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Some slopes of more than 12 percent.
Low to moderate.	Low	Pervious	Semipervious when compacted; medium stability; high shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Bedrock may hinder construction.	Seedbed difficult to prepare where slope is more than 12 percent.
Low to moderate.	Low	Pervious; shallow to bedrock.	Semipervious when compacted; high shrink-swell potential.	Adequate natural drainage.	Shallow to bedrock; low water-holding capacity.	Bedrock hinders construction.	Seedbed difficult to prepare; low water-holding capacity.
Moderate	Low	Semipervious; high water table. Suitable for dug ponds.	Impervious when compacted; medium stability; moderate shrink-swell potential; some hazard of piping.	Slow permeability; high water table; flooding.	Moderate water-intake rate; high water-holding capacity; poor natural drainage.	Most features favorable for diversions. Level relief; poor drainage; no erosion hazard.	Poor drainage; wetness may hinder construction.
Low	Low to moderate.	Pervious; seal blanket needed over sandy substratum.	Semipervious when compacted; medium stability; moderate shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Some slopes of more than 12 percent.
Low	Low	Pervious; bottom needs to be compacted.	Semipervious when compacted; medium stability; moderate shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Some slopes of more than 12 percent.
Low	Low	Pervious	Semipervious when compacted; in subsoil, medium stability; in substratum, high stability.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Sandy substratum exposed in some places where slope is more than 12 percent.

TABLE 5.—*Engineering*

Soil and map symbols	Suitability as source of—		Degree of limitation for—		
	Topsoil	Sand and gravel	Highway subgrade [1]	Foundations for low buildings	Sewage disposal
Gullied land (Gu) Needs onsite investigation.					
Hixton:					
Loam (HIC2, HID2, HIE2).	Surface layer good. Subsoil fair: droughty in lower part.	Fair: substratum contains poorly graded sand; bedrock weakly cemented.	Moderate in subsoil: moderate shrink-swell potential; little pavement distortion. Slight in substratum: high stability.	Slight: very low compressibility; good shear strength; flows if saturated.	Moderate: free drainage at depth of 3 feet.
Sandy loam and complex (HsC2, HsD2, HsE, HsE2, HtF).	Surface layer fair. Subsoil poor to fair: droughty in lower part.	Fair: substratum contains poorly graded sand; bedrock weakly cemented.	Moderate in subsoil: moderate shrink-swell potential; little pavement distortion. Slight in substratum: high stability.	Slight: very low compressibility; good shear strength; flows if saturated.	Moderate: free drainage at depth of 3 feet.
Houghton (Hu)	Poor: erodible; oxidizes rapidly.	Unsuitable	Very severe: organic soil.	Very severe: organic soil.	Very severe: high water table.
Huntsville (Hv)	Surface layer good: dark colored; thick. Subsoil fair to good: thick.	Unsuitable	Severe in subsoil and substratum: unstable; low bearing capacity.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; liquifies when saturated; fair shear strength; moderate compressibility.	Severe: occasional flooding. Filter fields will not function when flooded.
Kickapoo (Kp)	Surface layer fair. Subsoil poor to fair: stratified fine sand and silt; erodible; occasional flooding.	Fair: substratum contains some poorly graded sand with silt lenses.	Severe in substratum: low stability when wet; low bearing capacity.	Moderate to severe: liquifies easily and flows as a viscous fluid; highly susceptible to frost heave and subsequent loss of strength; fair shear strength; low compressibility.	Severe: occasional flooding. Filter fields will not function when flooded.
Lawson (Ls)	Surface layer good: dark colored; thick. Subsoil fair to good: thick.	Unsuitable	Severe in subsoil and substratum: unstable at any moisture content; low bearing capacity.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; liquifies when saturated; fair shear strength; moderate compressibility.	Very severe: frequent flooding. Filter fields will not function when flooded.

See footnote at end of table.

interpretations—Continued

Corrosion potential		Soil features affecting—						
Metal	Concrete	Farm ponds: Reservoir	Farm ponds: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Low	Low	Pervious	Pervious when compacted; high stability; hazard of piping.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Sandy substratum; erosion hazard.	Vegetation difficult to establish and maintain; erosion hazard.
Low	Low	Pervious	Pervious when compacted; high stability; hazard of piping.	Adequate natural drainage.	Rapid water-intake rate; low water-holding capacity.	Sandy substratum; erosion hazard.	Vegetation difficult to establish and maintain; erosion hazard.
High	High where acid; low where neutral or alkaline.	Pervious; high water table; suitable for dug ponds; flotation of organic material likely.	Pervious when compacted; low stability; suitable for use in low embankments.	Moderate permeability; high water table.	Rapid water-intake rate; very high water-holding capacity; very poor natural drainage.	Low stability; erosion hazard.	Erosion hazard; wetness hinders construction.
Moderate	Low	Pervious	Semipervious when compacted; medium to low stability.	Occasional flooding.	Moderate water-intake rate; moderate water-holding capacity; occasional flooding.	Most features favorable for diversions. No erosion hazard.	Most features favorable.
Low	Low	Pervious	Semipervious when compacted; medium stability; low shrink-swell potential.	Occasional flooding.	Moderate water-intake rate; moderate water-holding capacity; occasional flooding.	Most features favorable for diversions. No erosion hazard.	Most features favorable.
Moderate	Low	Pervious	Semipervious when compacted; low stability.	Moderate to slow permeability; frequent flooding.	Moderate water-intake rate; high water-holding capacity; frequent flooding; somewhat poor natural drainage.	Most features favorable for diversions. No erosion hazard.	Wetness may hinder construction.

TABLE 5.—*Engineering*

Soil and map symbols	Suitability as source of—		Degree of limitation for—		
	Topsoil	Sand and gravel	Highway subgrade [1]	Foundations for low buildings	Sewage disposal
Lindstrom (LtC2, LtD2, LtE2).	Surface layer good: dark colored; thick. Subsoil fair: thick.	Unsuitable	Severe in subsoil: loss in bearing capacity when wet. Severe in substratum.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; saturation causes loss of cohesion and results in settlement; moderate compressibility; moderate shear strength.	Slight: moderate permeability.
Marsh (Ma) Needs onsite investigation.					
Medary (MeA, MeB2)	Surface layer good. Subsoil unsuitable to poor: clayey, plastic.	Unsuitable	Severe in subsoil: high plasticity; moderate shrink-swell potential; elasticity. Very severe in substratum: high shrink-swell potential.	Severe to very severe: expansive if initially dry; poor shear strength; high compressibility.	Severe: clayey; slowly permeable.
Muscatine (MuA, MuB)	Surface layer good: dark colored; thick. Subsoil poor to fair: thick; lower part sandy in places.	Unsuitable	Very severe in subsoil: moderate shrink-swell potential; low bearing capacity when wet. Severe in substratum: unstable.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; low cohesion when wet causes settlement; fair shear strength; liquifies readily.	Severe: fluctuating high water table; possible infiltration of silt into drain pipes and filter fields.
Norden (NfD2, NfE, NfE2, NfF, NlC2, NlD, NlD2, NlE, NlE2, NoB2, NoC2, NoD, NoD2, NoE, NoE2, NoF).	Surface layer fair in loams (NfD2, NfE, NfE2, NfF), and good in all others. Subsoil poor to fair: lower part sandy in places.	Fair: substratum contains poorly graded fine sand with lenses of siltstone and shale.	Very severe in subsoil: moderate shrink-swell potential; low bearing capacity. Slight in substratum: sandstone bedrock.	Slight if footings are in bedrock.	Slight in most places. Severe in substratum where soil is shallow over bedrock.
Norwalk (NwB2, NwC2, NwD2).	Surface layer good. Subsoil poor to fair: lower subsoil clayey in places.	Unsuitable	Severe: shrink-swell potential moderate in subsoil and high in substratum; low bearing capacity.	Moderate: fair shear strength; moderate compressibility.	Severe: clayey, very slowly permeable subsoil and substratum.
Orion (Or, Ow)	Surface layer good. Subsoil fair: thick; high water table; flooding.	Unsuitable	Severe in subsoil and substratum: low stability and low bearing capacity.	Moderate to severe: liquifies easily and may flow if excavated while saturated; highly susceptible to frost heave and subsequent loss of bearing strength; moderate compressibility.	Very severe: frequent flooding. Filter fields will not function when flooded.

See footnote at end of table.

interpretations—Continued

Corrosion potential		Soil features affecting—						
Metal	Concrete	Farm ponds: Reservoir	Farm ponds: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
Low	Low	Pervious	Semipervious when compacted; medium stability; susceptibility to piping in some layers.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Some slopes of more than 12 percent.
Moderate to high.	Low	Semipervious	Impervious when compacted; medium to low stability; moderate shrink-swell potential.	Slow permeability.	Moderate to slow water-intake rate; moderate water-holding capacity.	Most features favorable.	Clayey subsoil; seedbed preparation difficult.
Low to moderate.	Low	Pervious	Semipervious when compacted; medium stability; moderate shrink-swell potential; susceptibility to piping in substratum.	Moderately slow permeability.	Moderate water-intake rate; high water-holding capacity; somewhat poor natural drainage.	Wetness may hinder construction.	Wetness may hinder construction.
Low to moderate.	Low	Pervious	Semipervious when compacted; medium stability; moderate shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Low stability; erosion hazard; bedrock may hinder construction.	Some slopes of more than 12 percent; erosion hazard.
Low to moderate.	Low	Pervious	Semipervious when compacted; medium stability; clayey substratum; high to moderate shrink-swell potential.	Moderately slow permeability; occasional flooding.	Moderate to slow water-intake rate; moderate water-holding capacity.	Wetness may hinder construction.	Wetness may hinder construction.
Low	Low	Pervious	Semipervious when compacted; medium stability; piping hazard.	Moderate permeability; frequent flooding.	Moderate water-intake rate; moderate water-holding capacity; frequent flooding; somewhat poor natural drainage.	Most features favorable for diversions. No erosion hazard.	Wetness may hinder construction.

TABLE 5.—*Engineering*

Soil and map symbols	Suitability as source of—		Degree of limitation for—		
	Topsoil	Sand and gravel	Highway subgrade [1]	Foundations for low buildings	Sewage disposal
Palsgrove (PaB, PaB2, PaC, PaC2, PaD, PaD2, PaD3, PaE, PaE2).	Surface layer good. Subsoil poor to fair: clayey.	Unsuitable	Severe in subsoil and upper substratum: high plasticity; moderate shrink-swell potential; elasticity. Slight in lower substratum: dolomite.	Slight if footings are in dolomite bedrock. Very severe if footings are in clay residuum. Clay residuum has high shrink-swell potential; poor shear strength; very high compressibility.	Moderate where layer of clay is thick enough and permeable enough to absorb effluent.
Rockbridge (RbC2, RbD2).	Surface layer good. Subsoil poor to fair: lower part sandy and gravelly in many places.	Poor: substratum stratified; contains some poorly graded sand, chert gravel, and cobbles with some fines.	Severe in subsoil: moderate shrink-swell potential; low bearing capacity. Slight in substratum; lacks cohesiveness when dry.	Slight: good shear strength; very low compressibility.	Moderate: free drainage at 3 to 4 feet.
Rozetta (RoA, RoB)	Surface layer good. Subsoil poor to fair: thick; lower part sandy in places.	Poor: substratum contains poorly graded sand with silt lenses.	Severe in subsoil: moderate shrink-swell potential; low bearing capacity; elasticity. Severe in substratum: unstable.	Moderate to severe: highly susceptible to frost heave and subsequent loss of strength; low cohesion when wet causes settlement; fair shear strength; liquifies easily.	Moderate: possible infiltration of silt into drain pipes and gravel filter beds. Severe where drainage is poor.
Sogn	Surface layer thin and stony; closely underlain by shattered dolomite fragments and bedrock.	Unsuitable, except that dolomite bedrock can be crushed for gravel.	Slight in substratum: dolomite bedrock.	Slight: dolomite bedrock.	Very severe: very shallow to fractured bedrock; possible contamination of ground water.
Sparta (SaA, SaB2, SaC2).	Surface layer poor: dark colored; thick; droughty. Subsoil unsuitable: droughty; erosion hazard.	Fair: substratum contains poorly graded sand.	Slight: stable when wet; lacks cohesiveness when dry.	Slight: good shear strength; very low compressibility; may liquify if excavated when wet.	Slight: free flowing throughout profile.

See footnote at end of table.

interpretations—Continued

Corrosion potential		Soil features affecting—					
Metal	Concrete	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
		Reservoir	Embankments				
Low to moderate.	Low	Pervious	Semipervious when compacted; medium stability; clayey substratum; moderate shrink-swell potential.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Some slopes of more than 12 percent.
Low	Low	Pervious	Semipervious when compacted; medium stability; moderate shrink-swell potential; high stability.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Coarse substratum; erosion hazard.	Coarse substratum exposed in some places where slope is more than 12 percent.
Low	Moderate	Pervious	Semipervious when compacted; medium stability; moderate shrink-swell potential; susceptibility to piping in substratum.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity.	Most features favorable.	Most features favorable.
Low	Low	Pervious	Semipervious when compacted; medium stability; less than 12 inches deep to bedrock.	Adequate natural drainage.	Very shallow to bedrock.	Very shallow to bedrock	Very shallow to bedrock.
Low	Low	Very pervious	Pervious when compacted; high stability.	Excessive natural drainage.	Very rapid water-intake rate; very low water-holding capacity; wind erosion hazard.	Sandy texture; erosion hazard.	Vegetation difficult to establish and maintain; very difficult on slopes of more than 6 percent; erosion hazard.

TABLE 5.—*Engineering*

Soil and map symbols	Suitability as source of—		Degree of limitation for—		
	Topsoil	Sand and gravel	Highway subgrade [1]	Foundations for low buildings	Sewage disposal
Stony colluvial land (ScB, ScC). Needs onsite investigation.					
Stony rock land (SkE, SkF). Needs onsite investigation.					
Stronghurst: Silt loam (StB2, StC2).	Surface layer good. Subsoil poor to fair: thick; clayey in places.	Unsuitable	Severe in subsoil: moderate shrink-swell potential; high plasticity. Severe in substratum: moderate bearing capacity.	Severe: expansive when wet; fair shear strength; moderate compressibility.	Severe: fluctuating high water table.
Silt loam, benches (SuA, SuB).	Surface layer good. Subsoil poor to fair: thick; sandy in lower part.	Poor: substratum contains poorly graded sand with silt lenses.	Severe in subsoil: moderate shrink-swell potential; elasticity. Severe in substratum: unstable.	Moderate to severe: highly susceptible to frost heave and subsequent loss of bearing strength; low cohesion when wet causes settlement; fair shear strength; liquifies easily.	Severe: fluctuating water table; liquifies easily; possible infiltration of silt into drain pipes and gravel filter beds.
Tama (TaA, TaB, TaC2).	Surface layer good: thick; dark colored. Subsoil poor to fair: clayey in places.	Unsuitable	Severe in subsoil: moderate shrink-swell potential; low bearing capacity; elasticity. Severe in substratum: low bearing capacity.	Severe: expansive when wet; fair shear strength; moderate compressibility.	Slight: moderate permeability.
Tell (TeB2, TeC2, TeD2).	Surface layer good. Subsoil poor to fair: sandy in lower part.	Poor: substratum contains poorly graded sand; some fines.	Severe in subsoil: moderate shrink-swell potential; low bearing capacity. Slight in substratum: lacks cohesiveness when dry.	Slight: good shear strength; very low compressibility; liquifies easily.	Moderate: free drainage at 2 to 3 feet.
Terrace escarpments, loamy (Tr).	Surface and subsoil layers poor to fair: variable texture and thickness.	Questionable: contains poorly graded sand.	Variable in subsoil	Variable	Very severe: steep slopes.
Terrace escarpments, sandy (Ts).	Surface layer poor to fair: variable. Subsoil unsuitable: droughty; erosion hazard.	Fair: subsoil contains poorly graded sand.	Slight in substratum: lacks cohesiveness when dry.	Slight: good shear strength; low compressibility; liquifies when saturated.	Very severe: steep slopes.

See footnote at end of table.

interpretations—Continued

Corrosion potential		Soil features affecting—					
Metal	Concrete	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
		Reservoir	Embankments				
Low	Low to moderate.	Semipervious	Semipervious when compacted; medium stability; moderate shrink-swell potential.	Moderate to slow permeability; bedrock at depth of 4 to 6 feet; somewhat poor natural drainage.	Moderate water-intake rate; moderate water-holding capacity; somewhat poor natural drainage.	Wetness may hinder construction.	Wetness may hinder construction.
Low	Moderate	Semipervious: suitable for dug ponds.	Semipervious when compacted; medium stability; moderate shrink-swell potential.	Moderate to slow permeability; somewhat poor natural drainage.	Slow to moderate water-intake rate; moderate water-holding capacity; somewhat poor natural drainage.	Wetness may hinder construction.	Wetness may hinder construction.
Low	Low	Semipervious: bottom may need to be compacted.	Semipervious when compacted; medium stability; moderate shrink-swell potential; susceptibility to piping in substratum.	Adequate natural drainage.	Moderate water-intake rate; high water-holding capacity.	Most features favorable.	Most features favorable.
Low	Low	Pervious	Semipervious when compacted. Subsoil has medium stability and moderate shrink-swell potential. Substratum has high stability but is susceptible to piping.	Adequate natural drainage.	Moderate water-intake rate; moderate water-holding capacity	Sandy texture in substratum; erosion hazard.	Sand substratum exposed on slopes of more than 12 percent.
Low	Low to moderate.	Variable	Variable	Variable	Variable	Variable	Variable.
Low	Low	Variable	Variable	Variable	Variable	Variable	Variable.

TABLE 5.—*Engineering*

Soil and map symbols	Suitability as source of—		Degree of limitation for—		
	Topsoil	Sand and gravel	Highway subgrade [1]	Foundations for low buildings	Sewage disposal
Worthen:					
Silt loam (WoA, WoB, WoC).	Surface layer good: thick; dark colored. Subsoil fair to good: thick.	Unsuitable	Severe in subsoil and substratum: very low stability; low bearing capacity.	Moderate to severe: highly susceptible to frost heave and subsequent loss of bearing strength; liquifies when saturated; fair shear strength; moderate compressibility.	Severe: occasional flooding. Filter fields will not function when flooded.
Cherty silt loam (WcB, WcC, WcD).	Surface layer poor: stony. Subsoil poor: stony.	Poor: contains many chert fragments and cobbles.	Severe in subsoil and substratum: very low stability; low bearing capacity.	Moderate to severe: highly susceptible to frost heave and subsequent loss of bearing strength; liquifies when saturated; fair shear strength; moderate compressibility.	Severe: occasional flooding. Filter fields will not function when flooded.

[1] Engineers and others should not apply specific values to estimates of bearing capacity.

Corrosion potential.—Corrosion of underground metal and concrete conduits is closely related to soil reaction, drainage, and electrical conductivity. Most conduits are laid in the lower part of the soil or in the underlying material. Poor aeration, a high pH value, a high rate of electrical conductivity, and a high moisture content generally are characteristic of soils that are corrosive to metal conduits. Soils that have a low pH value are the most corrosive to concrete conduits. Both metal and concrete conduits corrode more rapidly if the content of moisture is high.

Farm ponds.—Among the features that influence the suitability of a soil for reservoirs and embankments for farm ponds are permeability, stoniness, depth to bedrock, level of the water table, strength and stability, shrink-swell potential, and organic-matter content.

Agricultural drainage.—Drainage for agriculture is affected by the rate at which water moves into and through a soil, by the presence of a restricting layer, by the depth to the water table, and by topography. Both surface and subsurface drainage are considered.

Irrigation.—Some of the characteristics and qualities considered in evaluating the suitability of a soil for irrigation are depth, water-holding capacity, permeability, natural drainage, and the rate of water intake. A strong slope is a less serious limitation for a sprinkler system than for a gravitational system.

Terraces and diversions.—The suitability of a soil for terraces and diversions depends mainly on topography, stoniness or rockiness, stability, texture, and thickness. Broad-base terraces are not suitable if the slope is more than 12 percent. Diversions can be used on the steeper slopes.

Grassed waterways.—The suitability of a soil for grassed waterways depends mainly on slope, stability, texture, thickness, and the ease with which a suitable vegetative cover can be established and maintained.

Descriptions of the Soils

This section describes the soil series and mapping units in Vernon County. The acreage and proportionate extent of each mapping unit are given in table 6.

The procedure in this section is first to describe the soil series and then the mapping units in the series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As explained in the section "How This Survey Was Made," not every mapping unit is a member of a soil series. For example, Stony rock land, moderately steep, and Stony rock land, steep, are land types and are not part of any series; nevertheless, they and the other land types in the county are described in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and woodland group in which the mapping unit has been placed. The pages on which each capability unit and woodland suitability group are described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

Soil scientists, engineers, students, and others who want detailed descriptions of the soil series should refer to the section "Formation and Classification of the Soils." Many

interpretations—Continued

Corrosion potential		Soil features affecting—						
Metal	Concrete	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Grassed waterways
		Reservoir	Embankments				
Moderate	Low	Pervious	Semipervious when compacted; low stability.	Occasional flooding.	Moderate water-intake rate; moderate to high water-holding capacity; somewhat poor natural drainage.	Most features favorable for diversions. No erosion hazard.	Most features favorable.
Low	Low	Pervious	Semipervious when compacted; low stability.	Occasional flooding.	Moderate water-intake rate; moderate to high water-holding capacity; somewhat poor natural drainage.	Most features favorable for diversions. No erosion hazard.	Most features favorable.

terms used in the soil descriptions and in other sections are defined in the Glossary.

Alluvial Land

This land type consists of sandy and loamy deposits on flood plains.

Alluvial land (0 to 2 percent slopes) (Ad).—This land type consists of nearly level stratified sandy and loamy deposits. It is on the lower parts of flood plains along small streams. The surface texture varies from coarse fragments to loam. The sequence and texture of the stratified soil materials are variable throughout the profile. Included in this land type are areas, less than 1 acre in size, of other land types, such as gravelly alluvium, and of soils derived from alluvium.

The natural fertility of this land type is moderately high, the moisture-supplying capacity is generally high, and the reaction is nearly neutral. The water table is generally at a depth of more than 2 feet. The flood hazard is severe.

The high water table and the severe hazard of flooding severely limit the suitability of these areas for cultivation. Pasture, woodland, and wildlife habitat are suitable uses. Small areas are cultivated, but most of the acreage is in pasture or trees. (Capability unit IIIw–12; woodland group 9)

Alluvial land, wet (0 to 2 percent slopes) (Al).—This land type consists of poorly drained sandy and loamy stream deposits on flood plains of the larger streams, including the Mississippi River. The water table is at a depth of less than 2 feet. Flooding here is more frequent and of longer duration than on areas of Alluvial land. Included in this land type are areas, less than 1 acre in size, of other miscellaneous land types, such as gravelly alluvium and marsh, and of soils derived from alluvium. These areas are too small to be mapped separately.

Alluvial land, wet, is not suited for cultivation. It is best suited to pasture, to trees, or to use as wildlife and recreation areas. (Capability unit Vw–14; woodland group 9)

Arenzville Series

The Arenzville series consists of well drained and moderately well drained stratified soils. These soils are on the natural levees along nearly all the perennial and intermittent streams. They developed in silty and loamy material that was washed down from the uplands and deposited on the stream bottoms.

Representative profile of Arenzville silt loam:

0 to 4 inches, very dark grayish-brown, friable silt loam.
4 to 36 inches, very dark grayish-brown, friable silt loam with a few thin seams of very dark grayish-brown very fine sand and fine sand.
36 to 40 inches, stratified very dark gray and very dark grayish-brown, friable silt loam with few dark-brown mottles.
40 to 60 inches +, black, friable silt loam with few dark-brown mottles.

In some areas, these soils have chert on the surface. The natural fertility is high, the moisture-supplying capacity is high, and the reaction is mildly alkaline to neutral. Permeability is moderate. The water table is generally at a depth of more than 4 feet, and it does not interfere with root growth. Occasional flooding and streambank erosion are hazards in most areas.

TABLE 6.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Alluvial land	2, 380	0. 5
Alluvial land, wet	4, 620	. 9
Arenzville silt loam	6, 530	1. 3
Ashdale silt loam, 2 to 6 percent slopes, moderately eroded	85	(1)
Ashdale silt loam, 6 to 12 percent slopes, moderately eroded	385	. 1
Ashdale silt loam, 12 to 20 percent slopes, moderately eroded	2, 695	. 5
Ashdale silt loam, 12 to 20 percent slopes, severely eroded	170	(1)
Boaz silt loam	2, 190	. 4
Boone loamy sand, 12 to 30 percent slopes	180	(1)
Boone loamy sand, 30 to 45 percent slopes	245	(1)
Chaseburg silt loam, 0 to 2 percent slopes	865	. 2
Chaseburg silt loam, 2 to 6 percent slopes	5, 815	1. 1
Chaseburg silt loam, 6 to 12 percent slopes	500	. 1
Dakota sandy loam, 0 to 2 percent slopes	75	(1)
Dakota sandy loam, 2 to 6 percent slopes	385	. 1
Dakota sandy loam, 2 to 6 percent slopes, moderately eroded	255	(1)
Dakota sandy loam, 6 to 12 percent slopes, moderately eroded	242	(1)
Dodgeville silt loam, 12 to 20 percent slopes, moderately eroded	190	(1)
Downs-Tama silt loams, 0 to 2 percent slopes	165	(1)
Downs-Tama silt loams, 2 to 6 percent slopes	242	(1)
Downs-Tama silt loams, 2 to 6 percent slopes, moderately eroded	5, 095	1. 0
Downs-Tama silt loams, 6 to 12 percent slopes, moderately eroded	12, 045	2. 3
Downs-Tama silt loams, 12 to 20 percent slopes, moderately eroded	745	. 1
Dubuque silt loam, 2 to 6 percent slopes	335	. 1
Dubuque silt loam, 2 to 6 percent slopes, moderately eroded	1, 665	. 3
Dubuque silt loam, 6 to 12 percent slopes	1, 595	. 3
Dubuque silt loam, 6 to 12 percent slopes, moderately eroded	10, 115	2. 0
Dubuque silt loam, 12 to 20 percent slopes	4, 805	. 9
Dubuque silt loam, 12 to 20 percent slopes, moderately eroded	19, 345	3. 7
Dubuque silt loam, 20 to 30 percent slopes	9, 130	1. 8
Dubuque silt loam, 20 to 30 percent slopes, moderately eroded	5, 167	1. 0
Dubuque silt loam, 30 to 45 percent slopes	2, 710	. 5
Dubuque soils, 6 to 12 percent slopes, severely eroded	175	(1)
Dubuque soils, 12 to 20 percent slopes, severely eroded	1, 095	. 2
Dubuque soils, 20 to 30 percent slopes, severely eroded	145	(1)
Dubuque-Gale silt loams, 2 to 6 percent slopes	390	. 1
Dubuque-Gale silt loams, 2 to 6 percent slopes, moderately eroded	515	. 1
Dubuque-Gale silt loams, 6 to 12 percent slopes, moderately eroded	2, 010	. 4
Dubuque-Gale silt loams, 12 to 20 percent slopes, moderately eroded	1, 210	. 2
Dunbarton and Sogn stony soils, 12 to 20 percent slopes	1, 189	. 2
Dunbarton and Sogn stony soils, 20 to 30 percent slopes	2, 470	. 5
Ettrick silt loam	2, 485	. 5
Fayette silt loam, uplands, 2 to 6 percent slopes	645	. 1
Fayette silt loam, uplands, 2 to 6 percent slopes, moderately eroded	8, 790	1. 7
Fayette silt loam, uplands, 6 to 12 percent slopes	935	. 2
Fayette silt loam, uplands, 6 to 12 percent slopes, moderately eroded	32, 665	6. 3
Fayette silt loam, uplands, 12 to 20 percent slopes	3, 500	. 7
Fayette silt loam, uplands, 12 to 20 percent slopes, moderately eroded	35, 110	6. 8
Fayette silt loam, uplands, 12 to 20 percent slopes, severely eroded	465	. 1
Fayette silt loam, uplands, 20 to 30 percent slopes	650	. 1
Fayette silt loam, uplands, 20 to 30 percent slopes, moderately eroded	1, 000	. 2
Fayette silt loam, benches, 0 to 2 percent slopes	300	. 1
Fayette silt loam, benches, 2 to 6 percent slopes	1, 445	. 3
Fayette silt loam, benches, 2 to 6 percent slopes, moderately eroded	580	. 1
Fayette silt loam, benches, 6 to 12 percent slopes, moderately eroded	675	. 1
Fayette silt loam, valleys, 6 to 12 percent slopes	395	. 1
Fayette silt loam, valleys, 6 to 12 percent slopes, moderately eroded	1, 230	. 2
Fayette silt loam, valleys, 12 to 20 percent slopes	1, 165	. 2
Fayette silt loam, valleys, 12 to 20 percent slopes, moderately eroded	7, 290	1. 4
Fayette silt loam, valleys, 20 to 30 percent slopes	4, 640	. 9
Fayette silt loam, valleys, 20 to 30 percent slopes, moderately eroded	9, 445	1. 8
Fayette silt loam, valleys, 30 to 45 percent slopes	1, 305	. 2
Gale silt loam, 2 to 6 percent slopes, moderately eroded	120	(1)
Gale silt loam, 6 to 12 percent slopes, moderately eroded	590	. 1
Gale silt loam, 12 to 20 percent slopes, moderately eroded	970	. 2
Gale silt loam, 20 to 30 percent slopes	520	. 1
Gale silt loam, 20 to 30 percent slopes, moderately eroded	565	. 1
Gale silt loam, 30 to 45 percent slopes	470	. 1
Gullied land	160	(1)
Hixton loam, 6 to 12 percent slopes, moderately eroded	117	(1)
Hixton loam, 12 to 20 percent slopes, moderately eroded	455	. 1
Hixton loam, 20 to 30 percent slopes, moderately eroded	825	. 2
Hixton sandy loam, 6 to 12 percent slopes, moderately eroded	95	(1)
Hixton sandy loam, 12 to 20 percent slopes, moderately eroded	325	. 1
Hixton sandy loam, 20 to 30 percent slopes	585	. 1
Hixton sandy loam, 20 to 30 percent slopes, moderately eroded	640	. 1
Hixton soils, 30 to 45 percent slopes	1, 855	. 4
Houghton muck	575	. 1
Huntsville silt loam	1, 800	. 3
Kickapoo fine sandy loam	3, 545	. 7
Lawson silt loam	1, 480	. 3
Lindstrom silt loam, 6 to 12 percent slopes, moderately eroded	445	. 1
Lindstrom silt loam, 12 to 20 percent slopes, moderately eroded	725	. 1
Lindstrom silt loam, 20 to 30 percent slopes, moderately eroded	585	. 1
Marsh	1, 315	. 2
Medary silt loam, 0 to 2 percent slopes	300	. 1
Medary silt loam, 2 to 6 percent slopes, eroded	135	(1)
Muscatine silt loam, benches, 0 to 2 percent slopes	205	(1)
Muscatine silt loam, benches, 2 to 6 percent slopes	125	(1)
Norden fine sandy loam, 12 to 20 percent slopes, moderately eroded	560	. 1
Norden fine sandy loam, 20 to 30 percent slopes	2, 510	. 5

See footnote at end of table.

TABLE 6.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Norden fine sandy loam, 20 to 30 percent slopes, moderately eroded	2, 170	. 4	Rockbridge silt loam, 6 to 12 percent slopes, moderately eroded	100	(1)
Norden fine sandy loam, 30 to 45 percent slopes	3, 970	. 8	Rockbridge silt loam, 12 to 20 percent slopes, moderately eroded	190	(1)
Norden loam, 6 to 12 percent slopes, moderately eroded	160	(1)	Rozetta silt loam, benches, 0 to 2 percent slopes	1, 135	. 2
Norden loam, 12 to 20 percent slopes	390	. 1	Rozetta silt loam, benches, 2 to 6 percent slopes	495	. 1
Norden loam, 12 to 20 percent slopes, moderately eroded	645	. 1	Sparta loamy sand, 0 to 2 percent slopes	215	(1)
Norden loam, 20 to 30 percent slopes	3, 415	. 7	Sparta loamy sand, 2 to 6 percent slopes, eroded	425	. 1
Norden loam, 20 to 30 percent slopes, moderately eroded	4, 715	. 9	Sparta loamy sand, 6 to 12 percent slopes, eroded	150	(1)
Norden silt loam, 2 to 6 percent slopes, moderately eroded	95	(1)	Stony colluvial land, gently sloping	5, 510	1. 1
Norden silt loam, 6 to 12 percent slopes, moderately eroded	1, 835	. 3	Stony colluvial land, sloping	1, 915	. 4
Norden silt loam, 12 to 20 percent slopes	1, 730	. 3	Stony rock land, moderately steep	735	. 1
Norden silt loam, 12 to 20 percent slopes, moderately eroded	10, 215	2. 0	Stony rock land, steep	110, 132	21. 4
Norden silt loam, 20 to 30 percent slopes	2, 895	. 6	Stronghurst silt loam, 2 to 6 percent slopes, moderately eroded	1, 000	. 2
Norden silt loam, 20 to 30 percent slopes, moderately eroded	4, 130	. 8	Stronghurst silt loam, 6 to 12 percent slopes, moderately eroded	330	. 1
Norden silt loam, 30 to 45 percent slopes	590	. 1	Stronghurst silt loam, benches, 0 to 2 percent slopes	280	. 1
Norwalk silt loam, 2 to 6 percent slopes, eroded	305	(1)	Stronghurst silt loam, benches, 2 to 6 percent slopes	285	. 1
Norwalk silt loam, 6 to 12 percent slopes, moderately eroded	250	(1)	Tama silt loam, benches, 0 to 2 percent slopes	395	. 1
Norwalk silt loam, 12 to 20 percent slopes, moderately eroded	345	. 1	Tama silt loam, benches, 2 to 6 percent slopes	800	. 2
Orion silt loam	4, 800	. 9	Tama silt loam, benches, 6 to 12 percent slopes, moderately eroded	165	(1)
Orion silt loam, wet	4, 070	. 8	Tell silt loam, 2 to 6 percent slopes, eroded	225	(1)
Palsgrove silt loam, 2 to 6 percent slopes	470	. 1	Tell silt loam, 6 to 12 percent slopes, moderately eroded	133	(1)
Palsgrove silt loam, 2 to 6 percent slopes, moderately eroded	3, 965	. 8	Tell silt loam, 12 to 20 percent slopes, moderately eroded	170	(1)
Palsgrove silt loam, 6 to 12 percent slopes	2, 235	. 4	Terrace escarpments, loamy	1, 755	. 3
Palsgrove silt loam, 6 to 12 percent slopes, moderately eroded	16, 500	3. 2	Terrace escarpments, sandy	480	. 1
Palsgrove silt loam, 12 to 20 percent slopes	8, 820	1. 7	Worthen cherty silt loam, 2 to 6 percent slopes	250	(1)
Palsgrove silt loam, 12 to 20 percent slopes, moderately eroded	45, 601	8. 9	Worthen cherty silt loam, 6 to 12 percent slopes	540	. 1
Palsgrove silt loam, 12 to 20 percent slopes, severely eroded	1, 020	. 2	Worthen cherty silt loam, 12 to 20 percent slopes	220	(1)
Palsgrove silt loam, 20 to 30 percent slopes	6, 550	1. 3	Worthen silt loam, 0 to 2 percent slopes	555	. 1
Palsgrove silt loam, 20 to 30 percent slopes, moderately eroded	4, 052	. 8	Worthen silt loam, 2 to 6 percent slopes	2, 875	. 6
			Worthen silt loam, 6 to 12 percent slopes	375	. 1
			Total land area	515, 200	99. 0

[1]Less than 0.05 percent. These small acreages total 1 percent of the land area.

If protected from flooding, these soils are well suited to corn, tobacco, small grain, grass, and legumes. Areas that are inaccessible and areas that are flooded frequently are suitable for use as permanent pasture, woodland, and wildlife habitat.

Arenzville silt loam (0 to 2 percent slopes) (Ar).—This soil occurs on wide bottoms. It has the profile described for the series (fig. 5). Included in mapping were small areas of a soil that has a fine sandy loam surface layer and yellow and gray mottles.

Arenzville silt loam needs protection from flooding to be suitable for crops. (Capability unit IIw-11; woodland group 1)

Ashdale Series

The Ashdale series consists of well-drained soils on broad undulating ridges in the uplands. These soils formed in a blanket of wind-laid silt, 30 to 50 inches thick, over red clay weathered from dolomite. The native vegetation was prairie grass.

Representative profile of Ashdale silt loam, 2 to 6 percent slopes, moderately eroded:

0 to 13 inches, black to very dark brown, friable silt loam.
13 to 18 inches, very dark grayish-brown, friable silt loam.
18 to 25 inches, dark yellowish-brown, friable to firm heavy silt loam.
25 to 31 inches, brown, firm silty clay loam.
31 to 40 inches, yellowish-red and strong-brown, very firm silty clay.
40 to 55 inches +, red clay.

The clay residuum ranges in thickness from 1 foot to more than 3 feet. The chert content of the residuum ranges from nothing to 10 percent.

The natural fertility and the moisture-supplying capacity of these soils are moderately high, the organic-matter content is high, and the reaction is slightly acid to medium acid except where lime has been applied. Permeability is moderate. Water erosion is a hazard.

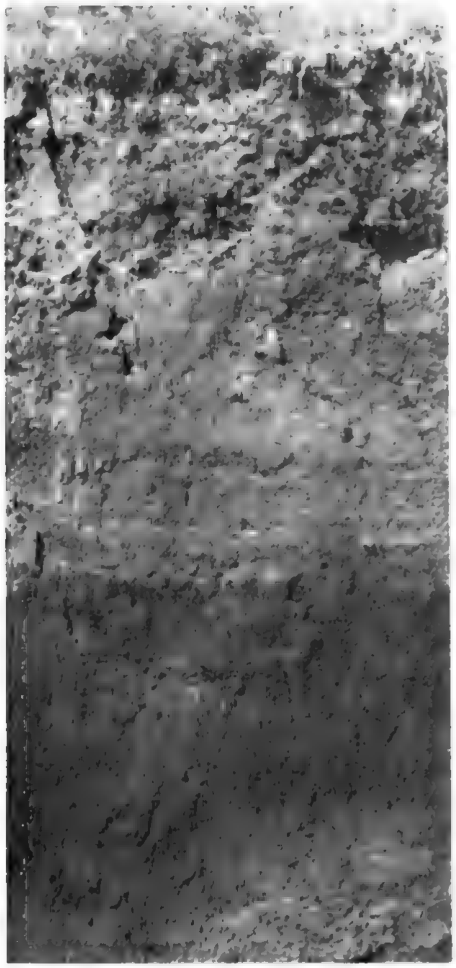

Figure 5.—Profile of Arenzville silt loam.

Ashdale silt loam, 2 to 6 percent slopes, moderately eroded (AsB2).—This soil is on the broad ridgetops. It has the profile described for the series. Included in mapping were a few small areas of slightly eroded soils.

The gentle relief and the thick, friable surface layer make this soil easy to cultivate. The hazard of water erosion is slight to moderate. The soil is well suited to row crops, small grain, and hay. All of it is used for crops. Lime is needed if legumes are grown. (Capability unit IIe–1; woodland group 12)

Ashdale silt loam, 6 to 12 percent slopes, moderately eroded (AsC2).—This soil is on ridgetops. The surface layer is slightly thinner and lighter colored than that in the profile described for the series. Water erosion has removed up to two-thirds of the original surface layer, and tillage operations have mixed a part of the browner subsoil with the plow layer. Included in mapping were a few small areas that are severely eroded.

If protected from erosion, this soil can be used for row crops. Lime is needed if legumes are grown. The erosion hazard is moderate. (Capability unit IIIe–1; woodland group 12)

Ashdale silt loam, 12 to 20 percent slopes, moderately eroded (AsD2).—This soil occurs in strips along the edges of ridgetops. The surface layer is thinner than that described for the series. The depth to the clay subsoil is generally about 30 inches.

Because of the moderately steep slopes and a severe erosion hazard, this soil is suitable for only occasional cultivation. Soil-conserving practices are needed if row crops are grown. Management needs include keeping the organic-matter content and the fertility at a high level and applying lime as needed. (Capability unit IVe–1; woodland group 12)

Ashdale silt loam, 12 to 20 percent slopes, severely eroded (AsD3).—This soil occurs as long, narrow areas along the edges of ridgetops. The surface layer is dark brown, and the yellowish-brown subsoil is exposed over more than 20 percent of the area. The tilth and structure of the surface layer are poorer and infiltration is slower than in the uneroded soils of this series. Also, the fertility is lower and the organic-matter content is less.

This soil is generally not suitable for cultivation, because of the moderately steep slopes and the effects of very severe erosion. It can be used for pasture, for hay, and for wildlife habitats. (Capability unit VIe–1; woodland group 12)

Boaz Series

The Boaz series consists of somewhat poorly drained, nearly level soils on high bottoms or low terraces near large streams. These soils formed in material that was washed down from the silt-covered uplands and deposited on the stream bottoms.

Representative profile of Boaz silt loam:

0 to 9 inches, very dark grayish-brown, friable silt loam.
9 to 16 inches, dark grayish-brown, friable silt loam.
16 to 36 inches, stratified grayish-brown and light brownish-gray, friable silt loam with many yellowish-red mottles.
36 to 42 inches, stratified grayish-brown and light brownish-gray, firm silty clay loam with many yellowish-red mottles.
42 to 60 inches, stratified light brownish-gray and yellowish-red, dense, plastic silty clay loam.

In a few areas there are thin layers of very fine sand in the profile. In some places the underlying material, at a depth of 3 feet or more, consists of stratified silt, sand, and clay.

The natural fertility of these soils is high, the moisture-supplying capacity is high, and the reaction is slightly acid to medium acid. Permeability is moderately slow. The water table is usually at a depth of 5 feet or less. Flooding is common. Unless removed by artificial drainage, floodwater is held in small depressions long enough to interfere with tillage.

If drained and protected from floods, these soils are suited to crops. If not drained, they are suitable for woodland, pasture, and wildlife habitat.

Boaz silt loam (0 to 2 percent slopes) (Bo).—Included with this soil in mapping were some areas covered by recent silt deposits 8 to 18 inches thick.

In some areas tile drainage is needed to make these soils suitable for crops. Surface drainage is needed to remove floodwater from small depressions. (Capability unit IIw–13; woodland group 9)

Boone Series

The Boone series consists of excessively drained soils that are shallow to moderately deep over sandstone. These

soils are on valley slopes below sandstone escarpments and at the base of rock outcrops on ridgelands.

Representative profile of Boone loamy sand, 30 to 45 percent slopes:

0 to 4 inches, very dark grayish-brown, loose loamy sand.
4 to 10 inches, yellowish-brown to dark yellowish-brown, loose sand.
10 to 15 inches, light brownish-gray, loose sand.
15 to 25 inches, light yellowish-brown, loose sand.
25 inches +, banded pale-yellow and white sandstone bedrock.

The natural fertility of these soils is low, the moisture-supplying capacity is low, and the reaction, except where lime has been applied, is medium to strongly acid. Permeability is very rapid. If the cover of vegetation is removed, erosion is a severe hazard.

Boone soils are too droughty to be suited to crops. They are suited to pasture or trees. A few small areas once used for crops are now being returned to pasture or trees.

Boone loamy sand, 12 to 30 percent slopes (BsE).—This soil generally occurs on upland ridges, in close association with sandstone outcrops. The depth to bedrock usually is more than 2 feet, but in places the sandstone is exposed. The surface layer is thicker and darker colored than that in the representative profile.

Both wind erosion and water erosion are hazards on this soil. Gullies enlarge rapidly unless erosion is controlled.

Most areas of this soil are in woodland and are only slightly eroded. Areas that formerly were cultivated are now used mainly for pasture or are left idle. They are suited to pasture or trees. Trees are harvested for timber or for Christmas trees. (Capability unit VIIs–9; woodland goup 4)

Boone loamy sand, 30 to 45 percent slopes (BsF).—This soil has the profile described for the series. Both wind erosion and water erosion are very severe hazards.

This soil is suitable for woodland and for wildlife habitat. If it is used for pasture, a vegetative cover sufficient for control of erosion should be maintained. (Capability unit VIIs–9; woodland group 4)

Chaseburg Series

The Chaseburg series consists of well drained to moderately well drained, deep soils in narrow drainageways, on bottoms along intermittent streams, and on the lower slopes of steep hills. These soils formed in 40 inches or more of light-colored silt washed from the uplands. Fresh silt is deposited annually. The native vegetation consisted of deciduous hardwoods.

Representative profile of Chaseburg silt loam, 0 to 2 percent slopes:

0 to 28 inches, friable silt loam; very dark grayish brown in upper part and brown in lower part.
28 to 35 inches, brown, friable silt loam.
35 to 60 inches +, yellowish-brown, friable silt loam.

In some profiles, there are thin layers of very fine sand and pebbles, and in many profiles there are alternate layers of light-colored and dark-colored silt.

The natural fertility of these soils is high, the moisture-supplying capacity is high, and the reaction is medium acid to neutral. Occasional flooding and streambank erosion are hazards.

If protected from flooding, these soils are well suited to corn, small grain, grass, and legumes. Inaccessible areas and those dissected by meandering streams are better suited to permanent pasture, woodland, or wildlife habitat.

Chaseburg silt loam, 0 to 2 percent slopes (CaA).—This soil occurs along intermittent drainageways in the uplands. It has the profile described for the series. It is flooded occasionally by runoff from surrounding areas.

This soil is suited to all crops commonly grown in the county. It can be cropped intensively if a good supply of plant nutrients is maintained and if a suitable cropping system is used. No special practices are needed except protection from flooding. Dikes may be used to prevent overflow. Areas not protected from floods are suitable for pasture or trees. The erosion hazard is slight.

Crops respond well to commercial fertilizer. Nitrogen is needed for corn. Lime is beneficial to legumes. (Capability unit I–1; woodland group 1)

Chaseburg silt loam, 2 to 6 percent slopes (CaB).—This soil occurs along drainageways, on bottoms along intermittent streams, and on alluvial fans on terraces and high bottoms. The surface layer is slightly thinner than that in the profile described for the series. In some areas the layer of recently deposited silty materials is less than 40 inches thick, and there is a light-colored, silty, buried soil that has a silty clay loam subsoil. In places, especially at the heads of draws, stones or cobblestones are scattered on the surface or throughout the profile.

This soil is suited to corn, small grain, grass, and legumes. It needs protection against erosion and also against deposition of infertile soil washed from higher lying areas. (Capability unit IIe–5; woodland group 1)

Chaseburg silt loam, 6 to 12 percent slopes (CaC).—This soil occurs on alluvial fans in the high parts of flood plains on sloping uplands. The surface layer is thinner and lighter colored than that in the profile described for the series. Stones and cobblestones occur on the surface and throughout the profile in many places.

This soil is suited to corn, small grain, grass, and legumes. Careful management is needed to control erosion and to prevent deposition of infertile soil washed from higher areas. Small isolated areas can be utilized for pasure, woodland, and wildlife habitat. (Capability unit IIIe–5; woodland group 1)

Dakota Series

The Dakota series consists of well-drained, nearly level to sloping soils that are moderately deep over sand. These soils are on terraces. They developed in water-deposited loamy material, under prairie grass.

Representative profile of Dakota sandy loam, 2 to 6 percent slopes:

0 to 12 inches, very dark grayish-brown, friable sandy loam.
12 to 16 inches, mixed very dark grayish-brown to dark-brown and brown, friable sandy loam.
16 to 24 inches, brown, friable heavy sandy loam.
24 to 34 inches, dark yellowish-brown, very friable sandy loam.
34 to 48 inches, yellowish-brown, loose fine sand.

The combined thickness of the surface layer and subsoil ranges from 24 to 40 inches. The thickness of the surface layer varies from 9 to 24 inches. The content of pebbles in the underlying sandy material is variable but generally is less than 20 percent.

The natural fertility of these soils is moderate, the moisture-supplying capacity is moderate, and, except where lime has been applied, the reaction is neutral to slightly acid. The organic-matter content is high. Permeability is moderately rapid.

Dakota soils are well suited to the commonly grown crops. Most areas are cultivated.

Dakota sandy loam, 0 to 2 percent slopes (DaA).—This soil is on broad stream terraces. The surface layer is slightly thinner than that in the profile described for the series, and the solum is deeper.

This soil is well suited to row crops, small grain, and hay. All of it is used as cropland. Because of being nearly level and having a thick, friable surface layer, this soil is easy to till. Droughtiness is a slight limitation, and wind erosion is a moderate hazard. Fertilizing, liming, and keeping the organic-matter content at a high level help to offset these limitations. (Capability unit IIIe-4; woodland group 3)

Dakota sandy loam, 2 to 6 percent slopes (DaB).—This soil is on small stream terraces. It has the profile described for the series. Both water erosion and wind erosion are hazards.

This soil can be cropped fairly intensively if lime and fertilizer are applied liberally and erosion is controlled. (Capability unit IIIe-4; woodland group 3)

Dakota sandy loam, 2 to 6 percent slopes, moderately eroded (DaB2).—This soil occurs on small stream terraces. The surface layer is thinner and lighter colored than that in the profile described for the series, and the subsoil is thinner. Water erosion has removed several inches of the original surface layer, and cultivation has mixed some of the lighter colored subsoil into the plow layer. The organic-matter content is somewhat less than in the uneroded soils. The erosion hazard is moderate.

This soil can be cropped rather intensively if erosion is controlled, if enough fertilizer and lime are applied, and if the organic-matter content is maintained. (Capability unit IIIe-4; woodland group 3)

Dakota sandy loam, 6 to 12 percent slopes, moderately eroded (DaC2).—This soil is on small stream terraces. The surface layer is lighter colored and thinner than that in the profile described for the series. Erosion has removed as much as 8 inches of the original surface layer, and some of the upper subsoil has been mixed into the plow layer. The depth to the sand substratum is generally less than 30 inches. Included in mapping were small areas of eroded Dakota sandy loam.

This soil is well suited to small grain and hay. Because of droughtiness and susceptibility to erosion, row crops can be grown only if suitable conservation measures are taken. Green-manure crops, barnyard manure, and crop residues can be utilized to add organic matter and thus improve tilth and increase the moisture-supplying capacity. Crops respond to lime and commercial fertilizer. (Capability unit IVe-4; woodland group 3)

Dodgeville Series

The Dodgeville series consists of well-drained soils on upland ridges above stream valleys. These soils formed in a blanket of wind-laid silt, 15 to 30 inches thick, over clay weathered from limestone. The native vegetation was prairie grass.

Representative profile of Dodgeville silt loam, 12 to 20 percent slopes:

0 to 14 inches, very dark grayish-brown, friable silt loam.
14 to 18 inches, dark yellowish-brown, firm silty clay loam.
18 to 24 inches, reddish-brown, sticky silty clay.
24 to 60 inches +, yellowish-red to dark reddish-brown, sticky clay.

The color of the surface layer ranges from black to very dark grayish brown. The silt mantle is generally 18 to 24 inches thick over clay.

The natural fertility of these soils is moderately high, the moisture-supplying capacity is moderate to high, and the reaction, except where lime has been applied, is acid to medium acid.

Dodgeville silt loam, 12 to 20 percent slopes, moderately eroded (DdD2).—This soil occurs on broad ridgetops. Erosion has removed part of the original surface layer. What is left has been mixed with the upper part of the subsoil. Small areas have lost all of the original surface layer, and in some of these areas the plow layer is a lighter colored silty clay loam. Erosion has impaired fertility and decreased the organic-matter content. Included in mapping were a few small areas of slightly eroded soil. The erosion hazard is severe.

This soil is not suited to intensive cultivation. If protected from erosion and if well managed otherwise, it can be used for row crops, small grain, and hay. (Capability unit IVe-2; woodland group 12)

Downs Series

The Downs series consists of well-drained, deep soils on uplands (fig. 6). These soils formed in silt picked up by wind from the Mississippi flood plain and deposited on the uplands.

Representative profile of Downs silt loam, 2 to 6 percent slopes:

0 to 7 inches, very dark gray, friable silt loam.
7 to 11 inches, dark grayish-brown, friable silt loam.
11 to 21 inches, brown, friable to firm heavy silt loam.
21 to 31 inches, brown, firm light silty clay loam.
31 to 45 inches, dark yellowish-brown, friable heavy silt loam.
45 to 60 inches +, yellowish-brown, friable silt loam.

The mantle of wind-deposited silt ranges from 4 to 6 feet in thickness. In most places limestone underlies the silt, but in a few areas the bedrock is sandstone.

The natural fertility of the Downs soils is high. Except where lime has been applied, the reaction is medium acid to slightly acid. Permeability is moderate. The moisture-supplying capacity is high. The water table is at a depth of more than 5 feet.

Downs soils are well suited to the commonly grown crops. Most areas are cultivated.

In this county the Downs soils are so intermingled with the areas of Tama soils that they were mapped together. The Tama soils are described under the heading "Tama Series."

Downs-Tama silt loams, 0 to 2 percent slopes (DmA).—These soils are on broad ridgetops. The profiles are slightly thicker than those described for the Downs and Tama series.

These soils are well suited to row crops, small grain, and hay. All of the acreage is used as cropland. The only

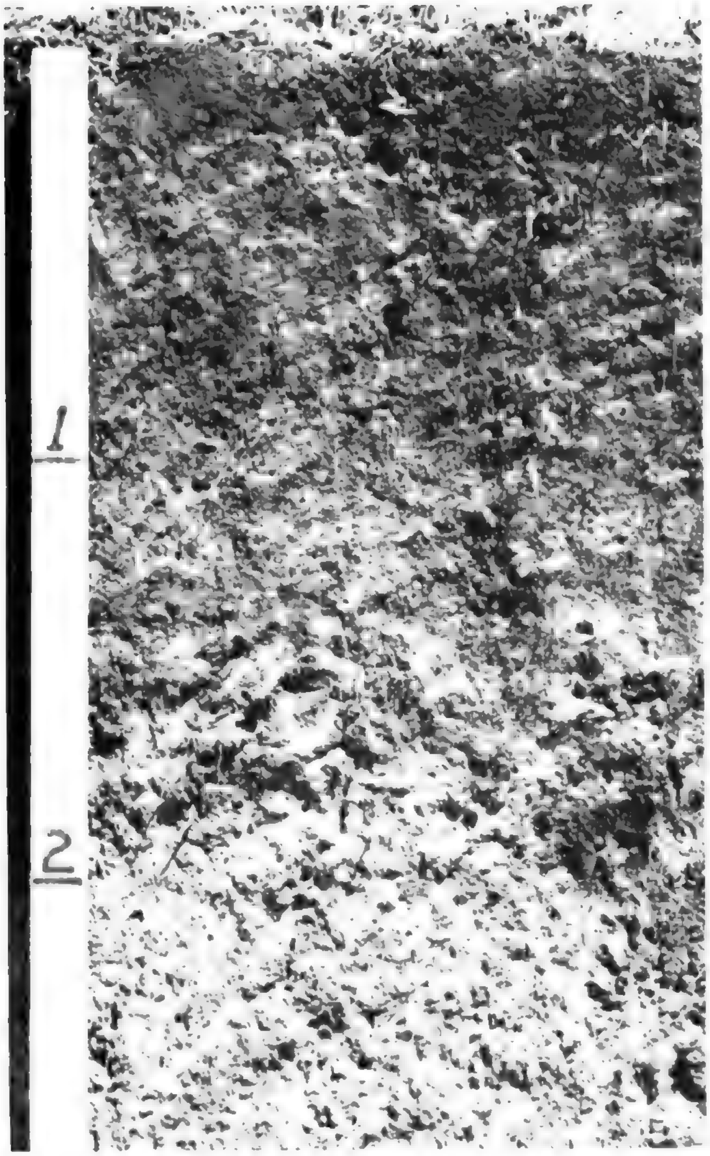

Figure 6.—Profile of Downs silt loam, showing root penetration to a depth of nearly 3 feet.

management problem is maintaining the supply of plant nutrients and organic matter. Lime is beneficial to legumes. (Capability unit I–1; woodland group 12)

Downs-Tama silt loams, 2 to 6 percent slopes (DmB).—These soils are on broad ridgetops. They have the profiles described for the Downs and Tama series. Included in mapping were a few small areas of moderately well drained soil. The erosion hazard is slight.

Nearly all of the acreage is used as cropland. Conservation practices help to control erosion and maintain the supply of plant nutrients and of organic matter. Crops respond to lime and commercial fertilizer. (Capability unit IIe–1; woodland group 12)

Downs-Tama silt loams, 2 to 6 percent slopes, moderately eroded (DmB2).—These soils are on broad ridgetops. The surface layers are thinner than those in the profiles described for the Downs and Tama series. About 6 inches of the original surface layer remains, and it has been mixed with the subsoil by plowing. Erosion has impaired fertility and decreased the organic-matter content. The erosion hazard is slight.

These soils are suited to row crops, small grain, and hay. Management practices that control erosion, supply organic matter, and maintain tilth are needed. (Capability unit IIe–1; woodland group 12)

Downs-Tama silt loams, 6 to 12 percent slopes, moderately eroded (DmC2).—These soils are on broad ridgetops. They are generally less than 3 feet thick over unweathered silt. The surface layers are thinner and lighter colored than those in the profiles described for the series. Because of erosion, only 3 to 6 inches of the original surface layer remains, and cultivation has mixed some of the upper part of the subsoil into the plow layer. The surface layer is less fertile and lower in organic-matter content than that of uneroded soils of these series, and it crusts more readily. Included in mapping were small areas of slightly eroded Downs and Tama silt loams and a few small areas that are severely eroded. The erosion hazard is moderate.

These soils are suited to row crops, small grain, and hay. Because of susceptibility to erosion, they should not be cropped intensively. (Capability unit IIIe–1; woodland group 12)

Downs-Tama silt loams, 12 to 20 percent slopes, moderately eroded (DmD2).—These soils are on slopes along the edges of upland ridges. The surface layer is lighter colored and thinner than that in the profile described for each of the series, and patches of the brown subsoil are exposed. These soils are less deep to unweathered silt. Runoff is rapid, and the hazard of water erosion is severe. Included in mapping were small areas of severely eroded Downs and Tama soils and a few small areas that are slightly eroded.

These soils are suitable for only occasional cultivation. Management needs include increasing the organic-matter content, improving tilth, and applying lime and fertilizer. (Capability unit IVe–1; woodland group 12)

Dubuque Series

The Dubuque series consists of well-drained soils on upland ridges above the stream valleys. These soils formed in a blanket of wind-laid silt, 15 to 30 inches thick, over reddish clay weathered from dolomite. The native vegetation was hardwood forest.

Representative profile of Dubuque silt loam, 2 to 6 percent slopes, moderately eroded:

- 0 to 8 inches, dark grayish-brown, friable silt loam.
- 8 to 12 inches, brown, friable heavy silt loam.
- 12 to 16 inches, brown, firm silty clay loam.
- 16 to 32 inches, reddish-brown, very firm clay.
- 32 to 36 inches, yellowish-red cherty clay.
- 36 to 40 inches, fissured dolomite bedrock; fissures are filled with cherty red clay.

The underlying clay is generally between 1 foot and 2 feet in thickness but is thicker in places. It contains variable amounts of chert.

The natural fertility of these soils is moderately high, the moisture-supplying capacity is moderate to very low, and the reaction is neutral to strongly acid. Permeability is moderate.

Dubuque silt loam, 2 to 6 percent slopes (DsB).—This soil occurs on the crests of ridges. The surface layer is

slightly thicker than that in the profile described for the series. Included in mapping were a few small areas in which the silt deposit was less than 15 inches thick.

This soil is suitable for corn, oats, alfalfa, and other common crops, but most of it is used as woodland or as pasture. If cultivated, it needs only simple conservation practices and general good management. (Capability unit IIe–2; woodland group 1)

Dubuque silt loam, 2 to 6 percent slopes, moderately eroded (DsB2).—This soil is mainly on the crests of ridges. It has the profile described for the series. The depth to bedrock is generally 30 to 36 inches. Included in mapping were a few small areas in which the silt deposit was less than 15 inches thick.

This soil is suited to all crops commonly grown in the area. Cropping systems that improve tilth, increase the organic-matter content, and improve permeability are needed. Practices that control erosion are necessary. Terraces or diversions can be used on long slopes. (Capability unit IIe–2; woodland group 1)

Dubuque silt loam, 6 to 12 percent slopes (DsC).—This soil is generally on the crests of narrower ridges and alongside the crests of wider ridges. The surface layer and subsoil are slightly thinner than those in the profile described for the series. The depth to bedrock is generally about 30 inches. The erosion hazard is moderate.

This soil is suited to row crops if intensive conservation practices are used. It has been used mainly as woodland and pasture. (Capability unit IIIe–2; woodland group 1)

Dubuque silt loam, 6 to 12 percent slopes, moderately eroded (DsC2).—This soil occurs on the crests of narrow ridges and on the sides of wider ridges. The surface layer is lighter colored than that in the profile described for the series; the surface layer and subsoil are thinner; and the depth to bedrock is slightly less. Water erosion has reduced the thickness of the surface layer to between 3 and 6 inches, and subsoil material is mixed into the plow layer. The present surface layer is less fertile and lower in organic-matter content than that of an uneroded soil of this series, and it crusts more readily. The erosion hazard is moderate.

This soil is suited to row crops. Control of erosion is especially important because of the moderate depth to bedrock. (Capability unit IIIe–2; woodland group 1)

Dubuque silt loam, 12 to 20 percent slopes (DsD).—This soil occurs on narrow ridges, near escarpment breaks, and around drainageways. The surface layer and subsoil are thinner than those described for the series, and the depth to bedrock is between 24 and 30 inches. Runoff is rapid, and the erosion hazard is severe. Included in mapping were a few areas in which the silt deposits are less than 15 inches thick.

If protected from erosion, this soil can be cultivated occasionally, but much of it has remained in pasture or woodland. (Capability unit IVe–2; woodland group 1)

Dubuque silt loam, 12 to 20 percent slopes, moderately eroded (DsD2).—This soil occurs on very narrow ridges, near escarpment breaks, and on slopes adjacent to drainageways. The surface layer is thinner and the subsoil slightly thinner than those in the profile described for the series. Water erosion has reduced the thickness of the original surface layer to about 4 inches and has decreased its organic-matter content and impaired its fertility. What remains of the original surface layer is mixed with subsoil material in the plow layer. Some small areas are so severely eroded that brown silty clay loam is exposed. Chert fragments are common on the surface. The hazard of erosion is severe.

If conservation practices are used, this soil can be cultivated occasionally. (Capability unit IVe–2; woodland group 1)

Dubuque silt loam, 20 to 30 percent slopes (DsE).—This soil is adjacent to stony and rocky escarpments. The surface layer and subsoil are thinner than those in the profile described for the series, and the depth to bedrock is 24 to 30 inches. Chert fragments are common on the surface. Included in mapping were small areas in which the silt mantle is less than 15 inches thick.

This soil has very severe limitations for use as cropland, because of the very severe hazard of erosion. It is suitable for grass or trees, and most of it is used as pasture or as woodland. (Capability unit VIe–2; woodland group 1)

Dubuque silt loam, 20 to 30 percent slopes, moderately eroded (DsE2).—This soil occurs in areas adjacent to stony and rocky escarpments. Water erosion has reduced the thickness of the original surface layer to about 4 inches and has decreased its organic-matter content and impaired its fertility. What remains of the original surface layer is mixed with subsoil material in the plow layer. Small areas are so severely eroded that reddish-brown clay is exposed. Chert fragments are common on the surface.

This soil is suitable for grass and trees. It has very severe limitations for use as cropland, mainly because of the very severe erosion hazard. (Capability unit VIe–2; woodland group 1)

Dubuque silt loam, 30 to 45 percent slopes (DsF).—This soil occurs just above the stony and rocky escarpments. Each layer in the profile is thinner than the corresponding layer in the profile described for the series. Outcrops of bedrock occur locally.

This soil has very severe limitations for use as cropland and severe limitations for use as pasture. Runoff would be very rapid and erosion severe under cultivation. Gullies are forming in some areas. Most of the acreage is pasture or woodland. (Capability unit VIIe–2; woodland group 1)

Dubuque soils, 6 to 12 percent slopes, severely eroded (DtC3).—These soils occur on the lower slopes of ridges. The surface layer is brown heavy silt loam and silty clay loam. In the most severely eroded areas, reddish-brown clay is exposed. Chert fragments are common. The erosion hazard is severe.

These soils are eroded as a result of intensive farming. They have very severe limitations for use as cropland. They contain little if any organic matter and have very poor tilth. The moisture-supplying capacity is much lower than that of the Dubuque silt loams. (Capability unit IVe–2; woodland group 1)

Dubuque soils, 12 to 20 percent slopes, severely eroded (DtD3).—These soils occur near the rim of broad ridgetops. The present surface layer consists mostly of material that was originally part of the subsoil. In places, even some of the subsoil has been lost through erosion and reddish-brown clay is at the surface. Chert fragments are common on the surface.

These soils have very severe limitations for use as cropland. They contain little or no organic matter and are in poor tilth. Runoff is rapid and, consequently, the hazard of further erosion is very severe. The moisture-supplying ca-

pacity is lower than that of the Dubuque silt loams. (Capability unit VIe–2; woodland group 1)

Dubuque soils, 20 to 30 percent slopes, severely eroded (DtE3).—The surface layer of these soils consists mainly of material that was originally part of the subsoil. In many places reddish-brown clay is at the surface. There are many rills and gullies. Most areas have chert fragments on the surface. The depth to bedrock is generally less than 30 inches. The erosion hazard is very severe.

These soils are not suited to crops. They have very low moisture-supplying capacity and low organic-matter content and are in poor tilth. They can be used as woodland, pasture, and wildlife habitat. (Capability unit VIIe–2; woodland group 1)

Dubuque-Gale silt loams, 2 to 6 percent slopes (DuB).—The Dubuque soil in this complex has a profile like the one described under the Dubuque series. The Gale soil is like Gale silt loam, 2 to 6 percent slopes, moderately eroded, except that it has a slightly thicker surface layer.

Most areas of this complex are used as woodland or pasture. The slight erosion hazard is the main limitation. (Capability unit IIe–2; woodland group 1)

Dubuque-Gale silt loams, 2 to 6 percent slopes, moderately eroded (DuB2).—The two soils in this complex are described under the respective series names. (Capability unit IIe–2; woodland group 1)

Dubuque-Gale silt loams, 6 to 12 percent slopes, moderately eroded (DuC2).—The two soils in this complex are described under the respective series names. Included in mapping were small areas that are only slightly eroded. (Capability unit IIIe–2; woodland group 1)

Dubuque-Gale silt loams, 12 to 20 percent slopes, moderately eroded (DuD2).—The two soils in this complex are described under the respective series names. (Capability unit IVe–2; woodland group 1)

Dunbarton Series

The Dunbarton series consists of well-drained soils that are underlain by dolomite bedrock at a depth of less than 20 inches.

Representative profile of a Dunbarton silt loam:

0 to 6 inches, grayish-brown, friable silt loam.
6 to 12 inches, brown, platy silt loam; silty clay loam in the lower 2 inches.
12 to 18 inches, dark reddish-brown, firm silty clay.
18 inches +, domolite bedrock.

The moisture-supplying capacity of these soils is moderately high, and permeability is moderate.

In Vernon County, Dunbarton soils are mapped only in undifferentiated units with soils of the Sogn series.

Dunbarton and Sogn stony soils, 12 to 20 percent slopes (DvD).—These soils occur on narrow ridges that are above and adjacent to stony, rocky escarpments. The texture of both is silt loam. The Sogn soil has a profile slightly shallower than the one described for the Sogn series. Included in mapping were small areas that have slopes of less than 12 percent.

These soils are too shallow, too stony, and too steep for use as cropland. The erosion hazard is very severe. (Capability unit VIs–5; woodland group 12)

Dunbarton and Sogn stony soils, 20 to 30 percent slopes (DvE).—These soils are adjacent to stony and rocky escarpments and adjacent to and above upland drainageways. The texture of both is silt loam. The Sogn soil has a profile slightly shallower than the one described for the Sogn series. Included in mapping was a small area of very steep soil.

The soils of this unit are too shallow, too stony, and too steep for use as cropland. The erosion hazard is very severe. They can be used for pasture and for wildlife areas. (Capability unit VIIs–5; woodland group 12)

Ettrick Series

The Ettrick series consists of nearly level, poorly drained soils on high bottoms and low terraces along the larger streams. These soils formed in material washed down from silt-covered terraces and uplands. The natural vegetation consisted of water-tolerant grass, sedges, and hardwoods.

Representative profile of Ettrick silt loam:

0 to 8 inches, black, friable silt loam.
8 to 15 inches, dark-gray, firm silty clay loam.
15 to 30 inches, grayish-brown, firm silty clay loam.
30 to 36 inches, light brownish-gray, sticky silty clay loam.
36 to 60 inches +, light brownish-gray, firm silt loam.

In areas recently flooded, 4 to 12 inches of light-colored silty soil has been deposited on the surface. Thin layers of very fine sand occur at various depths in some profiles. In some places the underlying material, at a depth of 3 feet or more, consists of stratified silt, sand, and clay.

The fertility of these soils is moderately high, the moisture-supplying capacity is high, and the reaction is mildly alkaline to neutral. The surface layer is very high in organic-matter content. Permeability is moderately slow. The water table is at or near the surface unless lowered by artificial drainage. Either tile or open ditches can be used where adequate outlets are available. Floods occur periodically and are especially likely after heavy rain. Water is held in small depressions long enough to interfere with tillage.

If drained and protected from floods, these soils are suited to crops. Areas not thoroughly drained are not suitable for alfalfa, but Alsike clover or Ladino clover can be substituted.

Ettrick silt loam (0 to 2 percent slopes) (Et).—This soil has the profile described for the Ettrick series. (Capability unit IIw–1; woodland group 9)

Fayette Series

The Fayette series consists of well-drained, deep soils on rolling upland ridges, on benches, and on valley slopes. These soils formed in 42 inches or more of wind-laid silt from the flood plains of the Mississippi River. The silt was probably deposited on the uplands about the time of the last glaciation. The Fayette soils on valley slopes formed partly in alluvium washed from the higher slopes. The natural vegetation consisted of various kinds of hardwoods.

Representative profile of Fayette silt loam, uplands, 2 to 6 percent slopes:

0 to 9 inches, grayish-brown and dark grayish-brown, friable silt loam.
9 to 15 inches, dark yellowish-brown to brown, friable heavy silt loam.
15 to 34 inches, brown, firm silty clay loam.
34 to 42 inches, brown, friable heavy silt loam.
42 to 60 inches, yellowish-brown, friable silt loam.

The mantle of silt generally is between 4 and 8 feet thick but is more than 8 feet thick on some of the broad, nearly level ridgetops. In some places where Fayette soils are at the foot of sandstone escarpments, they have a fine sandy loam surface layer. Some areas are underlain by dolomite or sandstone at depths of more than 8 feet.

The natural fertility of these soils is high, the moisture-supplying capacity is high to moderate, and the reaction is medium to slightly acid except where lime has been applied. Permeability is moderate. The water table is at a depth of more than 5 feet.

Fayette soils are used mainly as cropland. Where the slopes are favorable, they are fairly easy to cultivate and manage. They are suited to all crops commonly grown in the county. Lime is generally needed for legumes.

Fayette silt loam, uplands, 2 to 6 percent slopes (FuB).—This soil occurs on broad ridgetops. It has the profile described for the series.

Nearly all of this soil is used as cropland. Conservation practices are needed to control erosion and to maintain the supply of plant nutrients and organic matter. Crops respond favorably to lime and fertilizer. (Capability unit IIe–1; woodland group 1)

Fayette silt loam, uplands, 2 to 6 percent slopes, moderately eroded (FuB2).—This soil occurs on broad ridgetops. The surface layer is slightly thinner than that in the profile described for the series. Water erosion has reduced the thickness of the original surface layer to about 4 inches and has impaired its fertility and decreased its organic-matter content. What remains of the surface layer is mixed with subsoil material in the plow layer.

This soil is suited to row crops, small grain, and hay. Practices are needed that control erosion, supply organic matter, and maintain tilth. (Capability unit IIe–1; woodland group 1)

Fayette silt loam, uplands, 6 to 12 percent slopes (FuC).—This soil occurs on ridgetops. The surface layer is slightly thinner than that in the profile described for the series. Surface runoff is moderately rapid.

Erosion is a hazard if row crops are grown. Effective means of erosion control include contour stripcropping and diversions. (Capability unit IIIe–1; woodland group 1)

Fayette silt loam, uplands, 6 to 12 percent slopes, moderately eroded (FuC2).—This soil occurs on ridgetops. The surface layer is lighter colored and slightly thinner than that in the profile described for the series. Water erosion has reduced the thickness of the surface layer to between 3 and 6 inches. What remains of the original surface layer has been mixed with the upper part of the subsoil by plowing. The present surface layer is less fertile and lower in organic-matter content than that of an uneroded Fayette soil, and it crusts more readily. The erosion hazard is moderate.

This soil is not suitable for intensive tillage. Row crops, small grain, and hay can be grown if enough fertilizer and lime are applied. Because of rapid runoff, conservation practices that will check erosion are needed. (Capability unit IIIe–1; woodland group 1)

Fayette silt loam, uplands, 12 to 20 percent slopes (FuD).—Much of this unit is on ridgetops, just above the escarpments. The surface layer and subsoil are thinner than those in the profile described for the series. Surface runoff is rapid, and erosion is a hazard in cultivated areas. The erosion hazard is severe.

Because of the slope, this soil is not suitable for intensive use as cropland. Cropping systems should consist mainly of small grain and hay. Row crops can be grown occasionally if conservation practices that control erosion are used. Crops respond to lime and fertilizer. Many areas are used as pasture or woodland. (Capability unit IVe–1; woodland group 1)

Fayette silt loam, uplands, 12 to 20 percent slopes, moderately eroded (FuD2).—This soil occurs on ridgetops. The surface layer and subsoil are thinner than those in the profile described for the series. Water erosion has reduced the thickness of the surface layer to about 4 to 6 inches and has decreased the organic-matter content and impaired the fertility. What remains of the original surface layer is mixed with the upper part of the subsoil in the plow layer. Included in mapping were small severely eroded areas in which the present surface layer is browner and crusts more readily. The erosion hazard is severe. (Capability unit IVe–1; woodland group 1)

Fayette silt loam, uplands, 12 to 20 percent slopes, severely eroded (FuD3).—This soil occurs on slopes adjacent to ridgetops. The present surface layer consists mainly of dark yellowish-brown material that was originally part of the subsoil. Rills and gullies are common. Tilth is poor, and the surface structure unfavorable. Infiltration is slow. The erosion hazard is very severe.

Because of the slope and the effects of erosion, it is best to keep this soil permanently in grass. Careful control of grazing is needed. (Capability unit VIe–1; woodland group 1)

Fayette silt loam, uplands, 20 to 30 percent slopes (FuE).—This soil occurs on ridgetops, just above the escarpments. The surface layer and the subsoil are slightly thinner than those in the profile described for the series. Surface runoff is rapid. If cultivated, this soil is highly susceptible to erosion.

This soil is not suitable for intensive cultivation. If protected from erosion and otherwise well managed, it can be used for crops in a cropping system that consists mainly of small grain and hay. (Capability unit VIe–1; woodland group 1)

Fayette silt loam, uplands, 20 to 30 percent slopes, moderately eroded (FuE2).—This soil occurs on ridgetops, just above the escarpments. The surface layer is thinner than that in the profile described for the series. The present surface layer consists mostly of dark yellowish-brown material that was originally part of the subsoil. The organic-matter content is low, and infiltration is slow. Tilth is poor, and the structure of the surface layer is generally unfavorable for cultivation. Included in mapping was a small acreage that has a slope of more than 30 percent. The erosion hazard is very severe.

Even though eroded, this soil can be used for pasture if carefully managed. (Capability unit VIe–1; woodland group 1)

Fayette silt loam, benches, 0 to 2 percent slopes (FaA).—This soil occurs on benches along major streams. To a depth of 50 inches, the profile is like the profile described for the series. Below this depth, the material is sandy outwash.

Nearly all of this soil is used as cropland. It is well suited to corn, oats, and hay. A few small scattered areas are

used as pasture or woodland. (Capability unit I–1; woodland group 1)

Fayette silt loam, benches, 2 to 6 percent slopes (FaB).—This soil occurs as broad areas on stream terraces. The profile is similar to the one described for the series. Below a depth of 50 inches is sandy outwash. Water is absorbed readily, and runoff creates no serious hazard.

Most of this soil is used as cropland. It is well suited to corn, oats, and hay. If measures are taken to control erosion, supply organic matter, and maintain fertility, it can be cropped intensively. A few areas that are not readily accessible are used as woodland. (Capability unit IIe–1; woodland group 1)

Fayette silt loam, benches, 2 to 6 percent slopes, moderately eroded (FaB2).—The surface layer of this soil is thinner and lighter colored than that in the profile described for the series. The organic-matter content and fertility level are lower. Only 3 to 6 inches of the original surface layer remains, and it has been mixed with the upper part of the subsoil. Erosion has reduced the organic-matter content and impaired the fertility.

This soil can be cropped intensively if a suitable cropping system is followed and measures are taken to control erosion. Crops respond to fertilizer and manure. Liming is beneficial. (Capability unit IIe–1; woodland group 1)

Fayette silt loam, benches, 6 to 12 percent slopes, moderately eroded (FaC2).—This soil has a thinner, lighter colored surface layer than that in the profile described for the series. Water erosion has reduced the thickness of the surface layer to 3 to 6 inches and has decreased the organic-matter content and impaired the fertility. What remains of the original surface layer is mixed with the upper part of the subsoil in the plow layer. On about half the acreage, plowing turns up the brown part of the subsoil. Included in mapping were a few small areas that are slightly eroded and a few that are severely eroded. The erosion hazard is moderate.

Because of the slope, this soil cannot be used intensively for row crops. Careful management is needed to control erosion and maintain the supply of nutrients. Crops respond well to a complete fertilizer. Green-manure crops and barnyard manure add organic matter and nitrogen. Liming is also beneficial. (Capability unit IIIe–1; woodland group 1)

Fayette silt loam, valleys, 6 to 12 percent slopes (FvC).—This soil is on concave valley slopes below Stony rock land. The profile (fig. 7) is similar to the profile described for the series, but it has a less distinct subsoil and is slightly coarser textured.

Tilth is good, and the structure of the surface layer is good. The organic-matter content is moderately high. Infiltration is moderate. The moisture-supplying capacity is moderately high. Runoff is moderately rapid, and the erosion hazard is moderate. The root zone is deep.

Effective measures for control of erosion include contour stripcropping and diversions. (Capability unit IIIe–1; woodland group 1)

Fayette silt loam, valleys, 6 to 12 percent slopes, moderately eroded (FvC2).—This soil is on concave valley slopes below Stony rock land. The surface layer is thinner than that in the profile described for the series. Only 3 to 6 inches of the original surface layer remains, and it is mixed with subsoil material in the plow layer. The present surface layer is lighter colored than that in the representative profile. It is lower in organic-matter content and it crusts more readily. Included in mapping were small areas of fine sandy loam and a few small areas of severely eroded soil. The erosion hazard is moderate.

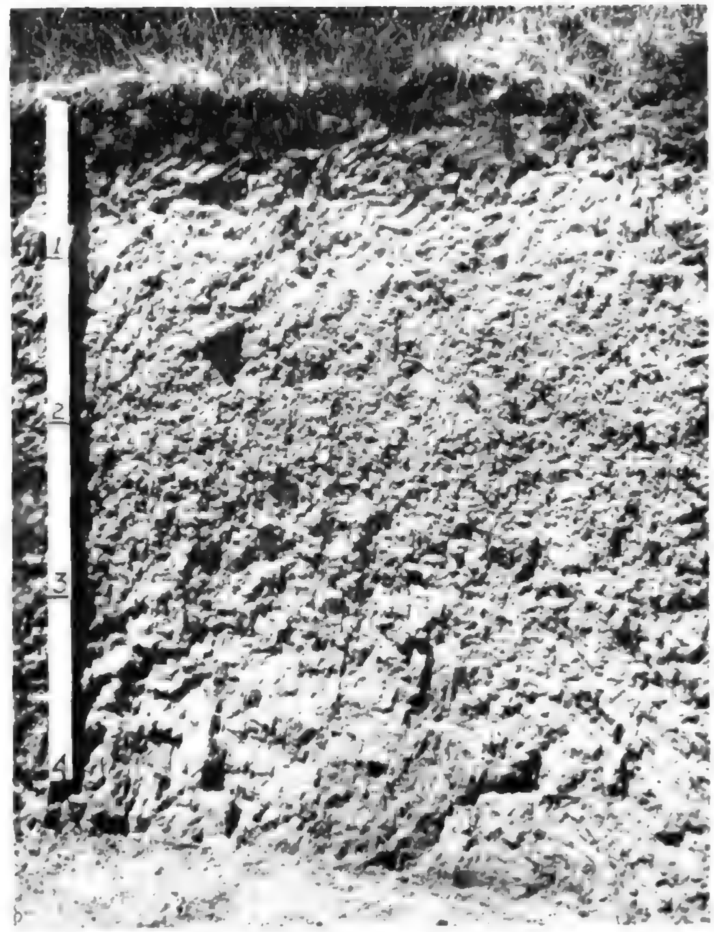

Figure 7.—**Profile of a valley phase of Fayette silt loam.**

This soil is not suitable for intensive cultivation but can be used for crops if enough fertilizer and lime are applied. Effective practices for control of erosion include stripcropping and terracing. (Capability unit IIIe–1; woodland group 1)

Fayette silt loam, valleys, 12 to 20 percent slopes (FvD).—This soil is on concave valley slopes below Stony rock land. The surface layer and subsoil are thinner than those in the profile described for the series. Some areas are stony. Surface runoff is rapid, and erosion is a severe hazard in cultivated areas. Included in mapping were small areas of fine sandy loam.

This soil is suited to small grain and hay, but it is too steep for intensive use as cropland. Row crops can be grown occasionally if measures are taken to control erosion. Crops respond to fertilizer and lime. Many areas are in pasture or woodland. (Capability unit IVe–1; woodland group 1)

Fayette silt loam, valleys, 12 to 20 percent slopes, moderately eroded (FvD2).—This soil is on concave valley slopes below areas of Stony rock land. The surface layer and subsoil are thinner than those in the profile described for the series. Some areas are stony. Water erosion has

reduced the thickness of the surface layer to less than 6 inches and has decreased the organic-matter content and impaired the fertility. In small areas, the present surface layer is browner than that in the representative profile and crusts more readily. Included in mapping were small areas of severely eroded soils and some fine sandy loam soils. The erosion hazard is severe.

This soil is not suitable for intensive cultivation. If protected from erosion and otherwise well managed, it can be used for crops in a system that consists largely of small grain and hay and includes only an occasional row crop. (Capability unit IVe-1; woodland group 1)

Fayette silt loam, valleys, 20 to 30 percent slopes (FvE).—Most of this soil is on valley slopes below areas of Stony rock land. The surface layer is much thinner than that in the profile described for the series. Some areas are stony. The rate of infiltration is favorable, the moisture-supplying capacity is moderate, and the root zone is deep. Because of the slope and runoff water from higher adjacent soils, the hazard of erosion is very severe. Included in mapping were a few small areas of fine sandy loam soils.

This soil is not suitable for cultivation. Most of it is used as woodland or pasture. Controlling grazing so as to maintain adequate cover helps to control erosion. (Capability unit VIe-1; woodland group 1)

Fayette silt loam, valleys, 20 to 30 percent slopes, moderately eroded (FvE2).—This soil occurs on valley slopes below Stony rock land. The surface layer is thinner and lighter colored than that in the profile described for the series. Water erosion has reduced the thickness of the surface layer to less than 4 inches. What remains of the original surface layer is mixed with subsoil material in the plow layer. Some areas of this soil are stony. Included in mapping were small areas of fine sandy loam soils.

This soil can be used as pasture or as woodland. Because of the slope and rapid runoff, it is subject to very severe erosion if cultivated. (Capability unit VIIe-1; woodland group 1)

Fayette silt loam, valleys, 30 to 45 percent slopes (FvF).—The surface layer of this soil is much thinner than that in the profile described for the series. Included in mapping were a few areas of stony soil and some moderately eroded soil.

Because of the slope and runoff water from higher adjacent soils, the erosion hazard is very severe. Pasture areas where grass cover is severely depleted by grazing are also very susceptible to erosion. (Capability unit VIIe-1; woodland group 1)

Gale Series

The Gale series consists of well-drained soils that are moderately deep over sand and weathered sandstone. These soils are on valley slopes and uplands along the major rivers. The upper layers formed in wind-laid silt, and the lower layers in materials weathered from sandstone.

Representative profile of Gale silt loam, 12 to 20 percent slopes:

- 0 to 6 inches, very dark grayish-brown, friable silt loam.
- 6 to 9 inches, dark grayish-brown, friable silt loam.
- 9 to 19 inches, brown to yellowish-brown, friable heavy silt loam.
- 19 to 29 inches, brown, friable to firm light silty clay loam.
- 29 to 48 inches, brownish-yellow, loose fine sand with bands of loamy fine sand.
- 48 inches +, sandstone.

The thickness of the surface layer ranges from 3 to 9 inches, depending upon the degree of erosion. In some places there are outcrops of sandstone.

Some areas of Gale soils are mapped as complexes with Dubuque soils.

The natural fertility of these soils is moderate, the moisture-supplying capacity is moderate, permeability is moderate, and the reaction is slightly acid to medium acid except where lime has been applied. A shortage of water is likely late in summer.

Gale soils are used for cultivated crops and pasture. Practices that control erosion are needed.

Gale silt loam, 2 to 6 percent slopes, moderately eroded (GaB2).—Most areas of this soil occur on ridgetops in the uplands. Although the surface layer has been thinned by erosion, the profile as a whole is deeper over sandstone than the profile described for the series. What remains of the original surface layer is mixed with the upper part of the subsoil. The present surface layer is lighter colored than that in the representative profile. Also, it is less fertile, is lower in organic-matter content, and crusts more readily.

If protected from further erosion, this soil is suitable for use as cropland. If row crops are grown, practices such as contour stripcropping and terracing are needed to control runoff. (Capability unit IIe-2; woodland group 1)

Gale silt loam, 6 to 12 percent slopes, moderately eroded (GaC2).—This soil occurs on the side slopes below areas of Gale silt loam, 2 to 6 percent slopes, moderately eroded. It has lost as much as two-thirds of the original surface layer through erosion. The present surface layer is a mixture of what remains of the original surface layer and material from the subsoil. It is lower in organic-matter content and less fertile than the surface layer of an uneroded Gale soil, and it crusts more readily. Included in mapping were small areas of slightly eroded Gale silt loam. The erosion hazard is moderate.

This soil is not suitable for intensive cultivation. If erosion is controlled, it can be used for row crops, small grain, and hay. (Capability unit IIIe-2; woodland group 1)

Gale silt loam, 12 to 20 percent slopes, moderately eroded (GaD2).—This soil is on valley slopes. The surface layer is thinner, lighter colored, and less friable than that in the profile described for the series. Water erosion has reduced the thickness of the surface layer to about 4 inches and has decreased its organic-matter content and impaired its fertility. Subsoil material has been mixed with what remains of the original surface layer. The depth to sandstone is between 24 and 30 inches in most areas. Included in mapping were a few severely eroded areas in which the surface layer consists mainly of material from the subsoil. The surface layer is browner and less friable than in the less eroded areas. Small areas of slightly eroded Gale silt loam were also included. The erosion hazard is severe.

Because of the slope, the moderate depth, and the effects of erosion, this soil is poorly suited to intensive cultivation. If erosion is controlled, row crops can be grown occasionally. Most areas are better suited to forage crops, pasture, or woodland. (Capability unit IVe-2; woodland group 1)

Gale silt loam, 20 to 30 percent slopes (GaE).—This soil occurs on side slopes below less sloping areas of Gale soils.

The surface layer and subsoil are slightly thinner than those in the profile described for the series, and the depth to bedrock is less.

The slope and the very severe erosion hazard restrict tillage. Most areas are used as woodland or pasture. Hay can be harvested from the areas that are not too steep. The steepest areas need renovation if used for pasture. (Capability unit VIe–2; woodland group 1)

Gale silt loam, 20 to 30 percent slopes, moderately eroded (GaE2).—The surface layer and subsoil of this soil are thinner than those in the profile described for the series, and the depth to bedrock is less. What remains of the original surface layer is mixed with the subsoil in the plow layer. Surface runoff is rapid, and rills and gullies are common in some areas.

Because of the slope and the very severe erosion hazard, this soil is not suitable for cultivation. It can be used as permanent pasture or as woodland. Hay can be harvested from some areas. (Capability unit VIe–2; woodland group 1)

Gale silt loam, 30 to 45 percent slopes (GaF).—Each layer in the profile of this soil is thinner than the corresponding layer in the profile described for the series. Surface runoff is very rapid, and the erosion hazard is very severe. Included in mapping were small areas of moderately eroded Gale silt loam.

This soil is not suitable for use as cropland. It is mainly in trees. If cleared, it has only limited value as pasture. Control of grazing helps to check sheet and gully erosion. (Capability unit VIIe–2; woodland group 1)

Gullied Land

Gullied land (Gu) (12 to 45 percent slopes) occurs as scattered areas generally less than 5 acres in size. Over 75 percent of the area consists of steep-sided gullies. The rest is made up of patches of Gale, Norden, Hixton, Fayette, benches, Dakota, and Tell soils.

Much of Gullied land is raw soil material that is very low in organic-matter content and very low in fertility. It is susceptible to very severe erosion. Runoff is rapid, and only a moderate to low amount of water is available for plants.

This land type is not suitable for use as cropland and has only limited value as pasture. It is suitable for use as woodland and as wildlife habitat. If it is used for pasture, careful control of grazing helps to check erosion. (Capability unit VIIe–4; woodland group 11)

Hixton Series

The Hixton series consists of well-drained soils that are moderately deep over sand. These soils are mainly on uplands and valley slopes. They formed in material weathered from sandstone, mixed with a small amount of silty material.

Representative profile of a Hixton loam, 12 to 20 percent slopes:

2 inches to 0, forest litter.
0 to 7 inches, very dark grayish-brown, very friable loam.
7 to 21 inches, brown, friable loam.
21 to 26 inches, yellowish-brown, very friable sandy loam.
26 to 60 inches +, brownish-yellow, loose fine sand.

The surface layer ranges in color from grayish-brown to very dark gray. It ranges in thickness from 3 inches to 12 inches. The depth to the underlying sandstone ranges from less than 20 inches to more than 36 inches.

The fertility of these soils is moderate to moderately low. The organic-matter content is relatively low. Except where lime has been applied, the reaction is slightly acid to very strongly acid. The moisture-supplying capacity is moderate to moderately low. Permeability is moderate to moderately rapid. Water erosion is a hazard.

Hixton soils are suited to crops, pasture, or woodland, depending on slope and texture.

Hixton loam, 6 to 12 percent slopes, moderately eroded (HIC2).—This soil occurs on side slopes below areas of more sloping Hixton soils. More than half of the original surface layer has been lost through erosion. The remaining half is mixed with the upper part of the subsoil. The present surface layer is lighter colored, less fertile, and lower in organic-matter content than that in the representative profile, and it crusts more readily. Included in mapping were a few small areas that are only slightly eroded. The erosion hazard is moderate.

This soil is not suitable for intensive cultivation. It can be used for row crops occasionally if erosion is controlled. Many areas are used as pasture. (Capability unit IIIe–2; woodland group 3)

Hixton loam, 12 to 20 percent slopes, moderately eroded (HID2).—This soil occurs on strongly sloping sides of valleys. The profile is thinner than the profile described for the series. Water erosion has reduced the thickness of the original surface layer to about 4 inches and has decreased the organic-matter content and impaired the fertility and the moisture-supplying capacity. The present surface layer is lighter colored and less friable than that in the representative profile. In most areas, the depth to sandstone bedrock is between 24 and 30 inches. Included in mapping were small areas of slightly eroded and severely eroded Hixton loam. The erosion hazard is severe.

Because of the slope, the moderate depth, and the effects of erosion, this soil is poorly suited to intensive cultivation. If erosion is controlled, row crops can be grown, but most areas are better suited to pasture, forage crops, or woodland. (Capability unit IVe–2; woodland group 3)

Hixton loam, 20 to 30 percent slopes, moderately eroded (HIE2).—This soil occurs on valley slopes. The surface layer and subsoil are slightly thinner than those in the profile described for the series, and the depth to bedrock is less. Erosion has reduced the thickness of the suface layer to 3 to 6 inches. What remains of the original surface layer is mixed with subsoil in the plow layer. Included in mapping were small areas of slightly eroded Hixton loam.

Because of the slope and the very severe erosion hazard, this soil should be kept in permanent pasture or woodland. Hay can be harvested from some areas. (Capability unit VIe–2; woodland group 3)

Hixton sandy loam, 6 to 12 percent slopes, moderately eroded (HsC2).—This soil occurs on side slopes below areas of less sloping Hixton and Gale soils. The profile is more sandy throughout than the one described for the series. As much as two-thirds of the original surface layer has been lost through erosion. What remains is mixed with the upper part of the subsoil. The present surface layer is lighter colored, less fertile, and lower in organic-matter content than that in the representative profile, and it

crusts more readily. The moisture-supplying capacity is moderately low, and permeability is moderately rapid. Included in mapping were a few small areas of slightly eroded and severely eroded soils. The erosion hazard is severe.

This soil is not suitable for intensive cultivation. It can be used occasionally for row crops if erosion is controlled. Many areas are used as woodland. (Capability unit IVe-4; woodland group 3)

Hixton sandy loam, 12 to 20 percent slopes, moderately eroded (HsD2).—This soil occurs on valley slopes. The profile is more sandy throughout and is shallower to bedrock than the profile described for the series. The surface layer is thinner and lighter colored than that in the representative profile, and it crusts more readily. Included in mapping were small areas of slightly eroded Hixton sandy loam and also a few small areas of severely eroded soil. The erosion hazard is very severe.

The slope, the moderate depth, and droughtiness make this soil unsuitable for row crops. It has been cropped in the past but is better suited to use as pasture or woodland. (Capability unit VIe-4; woodland group 3)

Hixton sandy loam, 20 to 30 percent slopes (HsE).—This soil occurs on valley slopes. The texture is more sandy throughout than that in the profile described for the series, the individual layers are thinner, and the depth to bedrock is less.

Because of the slope, rapid runoff, and the very severe erosion hazard, this soil is not suitable for cultivation. It can be used as woodland or pasture. If it is used as pasture, control of grazing is needed to maintain a cover adequate for erosion control. (Capability unit VIIe-4; woodland group 3)

Hixton sandy loam, 20 to 30 percent slopes, moderately eroded (HsE2).—This soil occurs on valley slopes. The texture is more sandy throughout than that in the profile described for the series, and the surface layer is thinner and lighter colored. Much of the present surface layer is brown because subsoil material is mixed into the plow layer. The depth to bedrock is generally less than 30 inches. The hazard of water erosion is very severe. Included in mapping were a few small areas of severely eroded soils.

The slope and the erosion hazard limit the use of this soil to pasture, woodland, and wildlife habitat. If it is used for pasture, control of grazing is needed to maintain a cover adequate for erosion control. (Capability unit VIIe-4; woodland group 3)

Hixton soils, 30 to 45 percent (HtF).—This unit consists of Hixton loam and Hixton sandy loam that are closely intermingled. It occurs on valley slopes just below sandstone outcrops. The surface layer and subsoil are thinner than those in the profile described for the series, and the depth to bedrock is less. Some areas are stony. The erosion hazard is very severe.

These soils are not suitable for cultivation. Much of the acreage is still woodland. (Capability unit VIIe-4; woodland group 3)

Houghton Series

This series consists of very poorly drained deposits of peat and muck, more than 42 inches thick. These deposits are in small depressed areas in the larger stream bottoms.

Representative profile of Houghton muck:

- 0 to 21 inches, black, very friable muck.
- 21 to 42 inches, very dark brown, friable mucky peat.
- 42 to 60 inches, black, friable muck.

Houghton muck is low in fertility and has a high moisture-supplying capacity. The reaction is slightly acid to neutral. Permeability is slow because the water table is at or near the surface.

If drained and adequately fertilized, these soils are suited to crops.

Houghton muck (0 to 2 percent slopes) (Hu).—In its natural state, this soil is too wet to be used as cropland. If an outlet is available, it can be artificially drained by means of tile or open ditches. If drained and fertilized, it is well suited to crops. (Capability unit IIIw-9; woodland group 10)

Huntsville Series

The Huntsville series consists of well drained to moderately well drained, dark-colored, deep soils that occur on the flood plains of nearly all the perennial and intermittent streams in the county. These soils formed in material washed down from the uplands.

Representative profile of Huntsville silt loam:

- 0 to 9 inches, very dark brown, very friable silt loam.
- 9 to 17 inches, black, friable silt loam.
- 17 to 29 inches, very dark grayish-brown, friable heavy silt loam.
- 29 to 36 inches, dark-brown, friable heavy loam.
- 36 to 42 inches, dark-brown, friable gritty loam; few yellowish-brown mottles.

In some profiles there are lighter colored layers of very fine sand or silty material. In some areas the profile is underlain with gray silt loam at a depth of 30 to 42 inches. The nature of the deposits and the rate of deposition determine the color, thickness, and number of soil layers.

The natural fertility of these soils is high. The moisture-supplying capacity is high, the organic-matter content is very high, and the reaction is neutral. Permeability is moderate. Some areas are flooded occasionally, but the water drains off quickly and, except in small depressions, causes little damage to crops.

If protected from flooding, these soils are well suited to corn, tobacco, small grain, grass, and legumes. Areas that are inaccessible because of meandering streams are suitable for use as permanent pasture or as wildlife habitat.

Huntsville silt loam (0 to 2 percent slopes) (Hv).—This soil has the profile described for the series.

The gentle relief and the thick, friable surface layer make this soil easy to till. Intensive cropping is practical if enough fertilizer and lime are used and management is generally good. Dikes and diversions are needed in some areas to prevent flooding. (Capability unit IIw-11; woodland group 12)

Kickapoo Series

The Kickapoo series consists of well drained and moderately well drained soils (fig. 8) on alluvial plains, low terraces, and natural levees.

Representative profile of Kickapoo fine sandy loam:

- 0 to 14 inches, stratified very dark grayish-brown and brown, friable fine sandy loam.

14 to 36 inches, dark-brown, friable fine sandy loam with fine strata of silt and sand.
36 to 60 inches, stratified very dark gray and dark gray silt loam, stratified below a depth of 40 inches with sand, fine sandy loam, and loam.

The natural fertility of these soils is moderate, the moisture-supplying capacity is moderate, the reaction is neutral or nearly neutral, and permeability is moderate. Occasional flooding is a hazard.

If protected from flooding, these soils can be used for cultivated crops.

Kickapoo fine sandy loam (0 to 2 percent slopes) (Kp).—On the wider bottom lands, this soil generally occurs near the stream channel, as a low natural levee. In a few areas it is gently undulating because of channel cutting and filling. Small areas of Arenzville silt loam were included in mapping. (Capability unit IIIw-12; woodland group 1)

Lawson Series

The Lawson series consists of somewhat poorly drained, nearly level, deep soils on smooth bottom lands. These soils formed in dark-colored material washed down from the silt-covered uplands.

Representative profile of Lawson silt loam, 0 to 2 percent slopes (cultivated):

0 to 8 inches, very dark brown, friable silt loam.
8 to 18 inches, very dark gray, friable silt loam.
18 to 24 inches, very dark gray, friable silt loam; few dark yellowish-brown mottles.
24 to 48 inches, very dark gray, friable heavy loam; dark yellowish-brown mottles.
48 to 54 inches, black, friable silt loam; few dark yellowish-brown mottles.

Some profiles contain lighter colored layers of very fine sand or silty material. In places the deposit of dark-colored silt loam is only 30 to 42 inches deep over gray silt loam or silty clay loam. The nature of the deposits and the rate of deposition determine the color, thickness, and number of horizons.

The fertility of these soils is high, the moisture-supplying capacity is high, the organic-matter content is very high, the reaction is neutral, and permeability is moderate. The water table is generally at a depth of 5 feet or less. The flood hazard is severe.

These soils are not suitable for crops unless drained and protected from flooding.

Lawson silt loam (0 to 2 percent slopes) (Ls).—This soil is generally nearly level, but slopes of 3 percent were included in mapping. Some areas are gently undulating as a result of channel cutting and filling.

Frequent flooding and ponding after rainfall make cultivation difficult. Areas that are artificially drained and protected from flooding are suitable for any of the commonly grown crops. Isolated areas and those that cannot be drained can be used as pasture or as wildlife habitat. (Capability unit IIw-13; woodland group 12)

Lindstrom Series

The Lindstrom series consists of well-drained, deep soils on concave valley slopes, below areas of Stony rock land, steep. These soils occur as small areas scattered throughout the county. They formed in 40 inches or more of loess

Figure 8.—**Profile of Kickapoo fine sandy loam, showing thin alternate layers of silt and sand over a darker colored buried soil.**

and alluvium washed down from steeper slopes. The native vegetation was mainly prairie grass.

Representative profile of Lindstrom silt loam, 6 to 12 percent slopes:

0 to 8 inches, black, friable silt loam.
8 to 16 inches, very dark brown to black, friable silt loam.
16 to 21 inches, very dark grayish-brown, friable silt loam.
21 to 40 inches, dark yellowish-brown, friable heavy silt loam.
40 to 50 inches, brown, friable heavy silt loam.
50 to 60 inches +, yellowish-brown, friable silt loam.

Where Lindstrom soils lie below sandstone escarpments, they have a thin surface layer of fine sandy loam. A few stones are on the surface and within the profile.

The natural fertility of these soils is high, the moisture-supplying capacity is high, permeability is moderate, and the reaction is slightly acid to neutral.

Where the slope is favorable and erosion is controlled, these soils are suited to cultivated crops.

Lindstrom silt loam, 6 to 12 percent slopes, moderately eroded (LtC2).—The surface layer of this soil is thinner and browner than that in the profile described for the series. Water erosion has reduced the thickness to about 8 inches and has decreased the organic-matter content and impaired the fertility. What remains of the original surface layer is mixed with material from the

subsoil. Included in mapping were small areas of Lindstrom silt loam that are slightly eroded.

If protected from erosion, this soil is suited to cultivated crops. The erosion hazard is moderate. (Capability unit IIIe–1; woodland group 12)

Lindstrom silt loam, 12 to 20 percent slopes, moderately eroded (LtD2).—This soil occurs on valley slopes. The surface layer is thinner and browner than that in the profile described for the series. Erosion has removed from one-third to two-thirds of the original surface layer and has decreased the organic-matter content and impaired the fertility. The rest of the original surface layer is mixed with material from the subsoil. Included in mapping were small areas that are slightly eroded. The erosion hazard is very severe.

This soil is suited to cultivated crops if erosion is controlled. (Capability unit IVe–1; woodland group 12)

Lindstrom silt loam, 20 to 30 percent slopes, moderately eroded (LtE2).—This soil occurs on valley slopes. The surface layer is thinner and lighter colored than that in the profile described for the series. Erosion has removed one-third to two-thirds of the original surface layer, and some of the dark-brown subsoil has been mixed into the plow layer. The organic-matter content is less than in an uneroded soil of this series; tilth is poorer; the moisture-supplying capacity is lower; infiltration is slower; and runoff is more rapid. The erosion hazard is very severe. Included in mapping were small areas that are slightly eroded.

This soil is not suitable for cultivation. It can be used as pasture and as wildlife habitat. (Capability unit VIe–1; woodland group 12)

Marsh

Marsh (0 to 1 percent slopes) (Ma) consists of very poorly drained alluvial and organic soils on stream bottoms. The natural vegetation consisted of cattails, rushes, sedges, willows, and other water-tolerant plants. A number of different soils are included, but all commonly have a dark-colored, silty surface layer and a gray, silty subsoil. In the lowest depressions are small areas of peat soils. Most areas of this land type are flooded and have a high water table the greater part of the year.

The fertility is moderate, the moisture-supplying capacity is high, and the reaction is slightly acid to neutral.

Marsh is not suitable for use as cropland and has only limited value for pasture or woodland. Artificial drainage generally is not economical or feasible. Marsh is best suited for use as sanctuaries for wildlife and as recreation areas. Level ditching improves the habitat for ducks, muskrats, and other wildlife. (Capability unit VIIIw–15; woodland group 11)

Medary Series

The Medary series consists of moderately well drained, deep soils on high stream terraces. These soils developed in a thin mantle of silt over water-laid clay. The clay was deposited in glacial times by backwater from the Mississippi River. Most areas of Medary soils occur in the lower parts of the Bad Axe River and Coon Creek valleys.

Representative profile of a Medary silt loam, 2 to 6 percent slopes:

0 to 7 inches, dark grayish-brown, very friable silt loam.
7 to 14 inches, dark yellowish-brown, firm silty clay loam.
14 to 24 inches, reddish-brown, sticky silty clay.
24 to 40 inches, reddish-brown, plastic silty clay with yellowish-red mottles.

The depth to silty clay ranges from 8 to 20 inches. The texture of the subsoil ranges from a heavy silty clay loam to clay.

Medary soils have a favorable moisture-supplying capacity. They stay wet till later in spring than some of the surrounding soils. Permeability and internal drainage are slow, and runoff is medium. The reaction is slightly acid to strongly acid, except where lime has been applied.

These soils are used mainly for cropland and pasture.

Medary silt loam, 0 to 2 percent slopes (MeA).—This soil occurs on high stream benches. The surface layer is thicker and mottling is nearer the surface than in the profile described for the series. Included in mapping were small areas of somewhat poorly drained soils.

This soil is suited to all crops commonly grown in the area. The main limitation is the slow movement of water through the profile. Removal of excess water in spring is a problem. If this soil is used intensively, conservation practices are needed to preserve good tilth, maintain the organic-matter content, and keep the fertility high. (Capability unit IIs–7; woodland group 2)

Medary silt loam, 2 to 6 percent slopes, eroded (MeB2).—This soil occurs on high stream benches. The surface layer is thinner and lighter colored than that in the profile described for the series. Some of the reddish-brown subsoil has been mixed into the plow layer, and reddish-brown spots are noticeable in cultivated fields. Tilth is poorer and the organic-matter content is less than in an uneroded soil of the series. Runoff creates a slight hazard of further erosion. Included in mapping were small areas of slightly eroded Medary silt loam.

If well managed, this soil can be used fairly intensively. Any of the crops common in the area can be grown. (Capability unit IIe–1; woodland group 2)

Muscatine Series

The Muscatine series consists of somewhat poorly drained, deep soils on benches along the larger streams. These soils formed in more than 42 inches of wind-laid and water-laid silt. The native vegetation was prairie grass.

Representative profile of Muscatine silt loam, benches, 0 to 2 percent slopes:

0 to 15 inches, very dark brown, friable silt loam.
15 to 28 inches, dark-gray, slightly sticky silty clay loam; many dark grayish-brown and yellowish-brown mottles.
28 to 42 inches, gray, slightly sticky silty clay loam; yellowish-brown mottles.
42 to 48 inches, light brownish-gray and yellowish-brown, plastic silty clay loam; thin lenses of sand; many dark reddish-brown mottles.
48 to 60 inches +, stratified silt and sand.

The degree of mottling and the color of the subsoil vary.

The fertility of these soils is high, the moisture-supplying capacity is high, the reaction is medium to slightly acid, and permeability is moderately slow. The water table

fluctuates and is commonly at a depth of between 4 and 6 feet. Surface drainage is slow in level or depressed areas. In many areas, artificial drainage would permit earlier use of the soils in spring. Where stream channels have recently been deepened, natural drainage has improved.

If adequately drained, Muscatine soils are well suited to the crops commonly grown in the county. Areas that are too wet for cultivation are suitable for use as pasture or as wildlife habitat.

Muscatine silt loam, benches, 0 to 2 percent slopes (MuA).—This soil occurs on low benches. It has the profile described for the series. Small depressions that retain water following prolonged or heavy rainfall interfere with tillage. Moderately slow internal drainage delays cultivation in spring.

Drainage needs to be improved to make this soil suitable for cultivation. Alfalfa is particularly hard to establish and maintain unless adequate drainage is provided. If artificially drained and well managed, this soil is well suited to corn, small grain, and hay crops. (Capability unit IIw–2; woodland group 12)

Muscatine silt loam, benches, 2 to 6 percent slopes (MuB).—This soil is better drained than the nearly level phase. The surface layer is thinner and grayer than that in the profile described for the series. Included in mapping were a few small areas with slopes of more than 6 percent.

If artificially drained and protected from erosion, this soil is well suited to corn, small grain, and hay crops. Where seepage interferes with tillage, corrective measures are needed to dry up the wet spots. (Capability unit IIw–2; woodland group 12)

Norden Series

The Norden series consists of well-drained soils on valley slopes and bedrock benches. These soils are moderately deep over fine-grained sandstone that contains layers of glauconitic sandstone, siltstone, and shale. The native vegetation consisted of mixed hardwood forests.

Representative profile of Norden silt loam, 20 to 30 percent slopes:

- 0 to 7 inches, very dark grayish-brown to dark grayish-brown, friable silt loam.
- 7 to 10 inches, dark grayish-brown, friable silt loam.
- 10 to 34 inches, brown to yellowish-brown, firm light silty clay loam.
- 34 to 40 inches, olive-brown sandy clay loam.
- 40 inches +, sandstone.

The texture of the surface layer ranges from silt loam to fine sandy loam. The soil formed in a silt mantle as much as 3 feet thick. The depth to sandstone bedrock ranges from 24 to 40 inches.

The permeability of these soils is moderate. Both moisture-supplying capacity and natural fertility are moderately low in Norden fine sandy loam and moderately high in Norden silt loam and Norden loam. The root zone is moderately deep. Except where lime has been applied, the reaction is slightly acid to medium acid. Runoff from higher areas is a hazard on valley slopes.

Norden soils are used extensively for all crops common in the area. The steeper parts are used mostly for pasture and woodland.

Norden fine sandy loam, 12 to 20 percent slopes, moderately eroded (NfD2).—This soil is on valley slopes. The surface layer is thinner and browner than that in the profile described for the series, and the texture is coarser throughout the profile. The structure of the surface layer is poorer and the organic-matter content is lower than in uneroded Norden fine sandy loams. In severely eroded cultivated fields, patches of the yellowish-brown subsoil are exposed. The hazard of further erosion is severe. Included in mapping were small areas that are slightly eroded.

Row crops can be grown occasionally if soil-conserving practices are applied. Legumes can be grown if fertilizer and organic matter are applied. (Capability unit IVe–2; woodland group 3)

Norden fine sandy loam, 20 to 30 percent slopes (NfE).—This soil is on valley slopes. Except for the texture of the surface layer, the profile is like the one described for the series. The erosion hazard is very severe.

Most of this soil is used as pasture or as woodland. Control of grazing is needed to maintain a plant cover adequate for erosion control. (Capability unit VIe–2; woodland group 3)

Norden fine sandy loam, 20 to 30 percent slopes, moderately eroded (NfE2).—This soil occurs on valley slopes. The surface layer is thinner and browner than that in the profile described for the series, and the depth to sandstone is less. Tillage has mixed some of the subsoil into the surface layer. The erosion hazard is very severe.

This soil is not suited to row crops. It can be used as pasture, woodland, or wildlife habitat. (Capability unit VIe–2; woodland group 3)

Norden fine sandy loam, 30 to 45 percent slopes (NfF).—This soil occurs on valley slopes. The surface layer is coarser textured, thinner, and browner than that in the profile described for the series, and the depth to sandstone is less. The erosion hazard is very severe.

This soil is not suited to row crops. It can be used as pasture, as woodland, and as wildlife habitat. (Capability unit VIIe–2; woodland group 3)

Norden loam, 6 to 12 percent slopes, moderately eroded (NlC2).—This soil occurs on valley slopes. The surface layer is lighter colored than that in the profile described for the series, and the depth to sandstone is less. The erosion hazard is moderate. Included in mapping were a few small areas that are slightly eroded and some that are on lower slopes.

This soil is suited to all crops commonly grown in the county. Practices to control erosion are needed if row crops are grown. Legumes need fertilizer and lime. (Capability unit IIIe–2; woodland group 1)

Norden loam, 12 to 20 percent slopes (NlD).—This soil occurs on valley slopes. The surface layer is slightly thicker than that in the profile described for the series. The erosion hazard is severe.

This soil is suitable for only occasional cultivation. Row crops can be grown safely if erosion is controlled. Legumes need fertilizer and lime. In pastures, control of grazing is needed to maintain a plant cover adequate for control of erosion. (Capability unit IVe–2; woodland group 1)

Norden loam, 12 to 20 percent slopes, moderately eroded (NlD2).—Much of the original surface layer of this soil has been lost through erosion. The present surface layer is thinner and browner than that in the profile described for the series. The fertility is lower, the organic-matter content is less, the structure and tilth are poorer,

and infiltration is slower than in an uneroded Norden loam. The erosion hazard is severe.

This soil is well suited for use as woodland. Row crops can be grown occasionally if erosion is controlled. Legumes need fertilizer and lime. (Capability unit IVe–2; woodland group 1)

Norden loam, 20 to 30 percent slopes (NlE).—This soil occurs on valley slopes, generally below escarpments of sandstone and limestone. The erosion hazard is very severe.

This soil can be used as pasture, as woodland, and as wildlife habitat. Control of grazing is needed to prevent injury to pasture sod. (Capability unit VIe–2; woodland group 1)

Norden loam, 20 to 30 percent slopes, moderately eroded (NlE2).—This soil occurs on valley slopes just below bedrock escarpments. The surface layer is thinner and browner than that in the profile described for the series, and the depth to sandstone is less. Erosion has removed much of the original surface layer, and the rest is mixed with subsoil material. The present surface layer is less fertile and lower in organic-matter content than that on uneroded Norden loam. The erosion hazard is very severe.

This soil is suitable for use as woodland or as pasture. (Capability unit VIe–2; woodland group 1)

Norden silt loam, 2 to 6 percent slopes, moderately eroded (NoB2).—This soil occurs on the crests of ridges. The surface layer is browner than that in the profile described for the series. It is less fertile and lower in organic-matter content than that of an uneroded Norden silt loam. Part of the subsoil has been mixed into the surface layer. Small patches of the brown subsoil are exposed in plowed fields. Included in mapping were small areas of slightly eroded Norden silt loam and a few small areas of fine sandy loam.

This soil is suitable for any of the crops commonly grown in the area. Soil-conserving practices for control of erosion are needed if row crops are grown. The addition of organic matter helps to improve tilth. Lime may be needed if legumes are grown. (Capability unit IIe–2; woodland group 1)

Norden silt loam, 6 to 12 percent slopes, moderately eroded (NoC2).—This soil occurs on the sides of valleys. Much of the original surface layer has been lost through erosion. The present surface layer is thinner and browner than that in the profile described for the series. It is less fertile and lower in organic-matter content than that of an uneroded Norden silt loam, and it has poorer tilth and slower infiltration. Patches of the brown subsoil are exposed in plowed fields. The erosion hazard is moderate. Included in mapping were small areas of slightly eroded Norden silt loam and a few areas of severely eroded Norden fine sandy loam.

This soil is suited to all crops commonly grown in the area. Soil-conserving practices are needed if row crops are grown. Applications of fertilizer and organic matter are needed, and lime may be needed if legumes are grown. (Capability unit IIIe–2; woodland group 1)

Norden silt loam, 12 to 20 percent slopes (NoD).—This soil occurs on valley slopes. The surface layer is slightly thicker than that in the profile described for the series, and the depth to sandstone is less. The erosion hazard is severe.

This soil is not well suited to row crops, but a row crop can be grown occasionally if soil-conserving practices for control of erosion are applied. Much of the soil is used as pasture and as woodland. Applications of fertilizer and organic matter help to maintain a cover. Lime may be needed if legumes are grown. (Capability unit IVe–2; woodland group 1)

Norden silt loam, 12 to 20 percent slopes, moderately eroded (NoD2).—This soil occurs on valley slopes. The surface layer is thinner and browner than that in the profile described for the series. It is less fertile and lower in organic-matter content than uneroded Norden silt loams, and it has poorer structure, poorer tilth, and slower infiltration. Patches of the brown subsoil are exposed in plowed fields. Included in mapping were small areas that are severely eroded. The erosion hazard is severe.

This soil is not well suited to row crops, but a row crop can be grown occasionally if soil-conserving practices are used. The major practices needed include keeping a high level of fertility and organic-matter content and controlling erosion. This soil is suitable for use as pasture or as woodland. (Capability unit IVe–2; woodland group 1)

Norden silt loam, 20 to 30 percent slopes (NoE).—This soil occurs on valley slopes. It has the profile described for the series (fig. 9).

Because of slope and a very severe erosion hazard, this soil is not suited to cultivated crops. Most of it is used as pasture or as woodland. Control of grazing is needed to maintain a good cover of pasture sod. (Capability unit VIe–2; woodland group 1)

Figure 9.—**Profile of Norden silt loam.**

Norden silt loam, 20 to 30 percent slopes, moderately eroded (NoE2).—This soil occurs on valley slopes. The surface layer is thinner and browner than that in the profile described for the series, and the depth to sandstone is less. Infiltration is slower than in uneroded Norden silt loams. Old rills and gullies are common. Included in mapping were small areas that are severely eroded. The erosion hazard is very severe.

This soil is not suited to cultivated crops, but it is suitable for use as pasture or as woodland. Control of grazing is needed to maintain a good pasture sod. (Capability unit VIe–2; woodland group 1)

Norden silt loam, 30 to 45 percent slopes (NoF).—The surface layer of this soil is thinner and browner than that in the profile described for the series. The depth to sandstone is less. In many places, the depth to bedrock is less than 2 feet. Included in mapping were small areas of loam and fine sandy loam.

This soil is suitable for use as woodland and as wildlife habitat, and it can also be used for pasture if grazing is controlled. The slope and the very severe erosion hazard make it unsuitable for cultivation. (Capability unit VIIe–2; woodland group 1)

Norwalk Series

The Norwalk series consists of moderately well drained, moderately deep soils on ridgelands. These soils developed in moderately deep deposits of silt over red clay residuum weathered from dolomite. The natural vegetation was hardwood forest.

Representative profile of a Norwalk silt loam, 2 to 6 percent slopes:

- 0 to 8 inches, dark grayish-brown, friable silt loam.
- 8 to 11 inches, grayish-brown, friable silt loam.
- 11 to 20 inches, brown, friable silt loam; a few dark yellowish-brown and yellowish-red mottles.
- 20 to 26 inches, yellowish-brown, firm silty clay loam; yellowish-red mottles.
- 26 to 40 inches, strong-brown, very firm silty clay or clay; cherty fragments.
- 40 inches +, cherty dolomite.

The depth to the silty clay or clay subsoil ranges from 15 to 30 inches but is generally about 2 feet. In places, shaly material underlies the silty layers. Chert fragments are numerous in the clayey lower part of the profile in places.

The moisture-supplying capacity of these soils is moderately high to high, the organic-matter content is somewhat low, and, except where lime has been applied, the reaction is acid. Permeability is moderately slow. Surface runoff is generally slow.

These soils are used mainly as cropland. They generally stay wet and cold till later in spring than surrounding soils that are better drained.

Norwalk silt loam, 2 to 6 percent slopes, eroded (NwB2).—This soil occurs on ridgetops, near the heads of drainageways. The surface layer is lighter colored, thinner, and lower in organic-matter content than that in the profile described for the series, and the depth to bedrock is less. Small patches of brown subsoil are exposed in areas that are plowed. Erosion has impaired tilth. Included in mapping were small areas that are slightly eroded.

This soil is suited to all crops commonly grown in the area. Row crops can be grown if soil-conserving practices are applied. (Capability unit IIe–2; woodland group 1)

Norwalk silt loam, 6 to 12 percent slopes, moderately eroded (NwC2).—This soil occurs at the head of drainageways on ridgetops and on lower slopes where seepage occurs. The surface layer is thinner and browner than that in the profile described for the series, and the depth to bedrock is less. Tillage has mixed part of the subsoil with the plow layer. Erosion has reduced the organic-matter content and impaired tilth. The erosion hazard is moderate. Included in mapping were a few small areas that are slightly eroded.

This soil is suited to crops if erosion is controlled and if manure, lime, and fertilizer are used. It is also suitable for use as pasture or woodland. (Capability unit IIIe–2; woodland group 1)

Norwalk silt loam, 12 to 20 percent slopes, moderately eroded (NwD2).—This soil occurs on slopes where seepage occurs and in draws leading down into drainageways. The surface layer is lighter colored and thinner than that in the profile described for the series. Tillage has mixed what remains of the original surface layer with material from the subsoil. The present surface layer has poorer tilth, a lower organic-matter content, and slower infiltration than the original surface layer. Included in mapping were a few small areas that are slightly eroded. The erosion hazard is severe.

This soil is not well suited to row crops, but row crops can be grown occasionally if erosion is controlled and if lime, manure, and fertilizer are applied. (Capability unit IVe–2; woodland group 1)

Orion Series

The Orion series consists of somewhat poorly drained, deep soils on bottom lands. These soils formed in silty material washed down from uplands.

Representative profile of Orion silt loam:

- 0 to 8 inches, dark grayish-brown, friable silt loam.
- 8 to 16 inches, dark-gray, friable silt loam; some dark reddish-brown mottles.
- 16 to 48 inches, dark grayish-brown, friable silt loam; few yellowish-red and yellowish-brown mottles.
- 48 to 55 inches, very dark gray, friable silt loam; few yellowish-red mottles.

Thin layers of fine sand are in the upper part of the profile in some places. The depth to mottling is generally less than 18 inches.

These soils have a high moisture-supplying capacity and moderate natural fertility. The reaction is neutral to a depth of about 4 feet. Permeability is moderate. The water table is generally at a depth of less than 5 feet. Frequent flooding and ponding make cultivation difficult.

If protected from overflow and artificially drained, these soils are suited to crops. Areas where artificial drainage is not feasible can be used as pasture, as woodland, or as wildlife habitat.

Orion silt loam (0 to 2 percent slopes) (Or).—This soil is on bottom lands. It is nearly level to gently undulating. It can be used as cropland if artificially drained. (Capability unit IIw–13; woodland group 9)

Orion Series, Wet Variant

The wet variant of the Orion series consists of poorly drained soils that formed in alluvium washed from silt-covered uplands.

Representative profile of Orion silt loam, wet variant:

0 to 24 inches, dark grayish-brown, nonsticky silt loam; yellowish-brown and dark reddish-brown mottles.
24 to 36 inches, dark-gray, nonsticky silt loam; dark reddish-brown mottles.
36 to 48 inches, dark-gray, nonsticky loam; dark reddish-brown mottles.
48 to 60 inches, gray, nonsticky silt loam; few greenish-gray and yellowish-red mottles.

The surface layer ranges from dark grayish brown and dark gray to very dark gray in color, and includes lenses of light-colored sand.

These soils have high fertility and a high moisture-supplying capacity. The reaction is neutral. Permeability is slow because the water table is at the surface or near the surface most of the year. The hazard of flooding is severe.

These soils are not suitable for cultivation, because it is generally not feasible to drain them or to protect them from overflow. Pasture and wildlife are suitable uses.

Orion silt loam, wet (0 to 2 percent slopes) (Ow).—This soil occurs on bottom lands in the wider stream valleys. It is not suitable for cultivated crops. (Capability unit Vw–14; woodland group 9)

Palsgrove Series

The Palsgrove series consists of well-drained, moderately deep, sloping to steep soils on upland ridges. These soils formed in a silt mantle over clayey residuum weathered from dolomite. The native vegetation was hardwood forest.

Representative profile of Palsgrove silt loam, 2 to 6 percent slopes:

0 to 7 inches, dark grayish-brown, friable silt loam.
7 to 15 inches, brown, friable heavy silt loam.
15 to 35 inches, dark yellowish-brown, firm silty clay loam.
35 to 42 inches, reddish-brown, very firm clay; many chert fragments.
42 inches +, dolomitic limestone bedrock.

The silty part of the profile is 20 to 40 inches in thickness. The color of the surface layer ranges from dark gray to very dark grayish brown. The depth to dolomite varies but is generally more than 40 inches.

The fertility of these soils is moderate, the moisture-supplying capacity is moderately high, and the reaction is medium acid. Permeability is moderate.

These soils are mostly in cultivation.

Palsgrove silt loam, 2 to 6 percent slopes (PaB).—This soil has the profile described for the series. It occurs on crests of ridges.

If cultivated this soil is subject to slight erosion, but it is suitable for use as cropland if properly managed. Practices such as contour stripcropping and terracing are needed to control erosion. Crops respond to applications of lime and fertilizer. Nearly all of the acreage is used as woodland or as pasture. (Capability unit IIe–1; woodland group 1)

Palsgrove silt loam, 2 to 6 percent slopes, moderately eroded (PaB2).—This soil occurs on crests of ridgetops. The surface layer is slightly thinner than that in the profile described for the series. Water erosion has reduced the thickness of the original surface layer and has lowered the organic-matter content and impaired the fertility. What remains of the original surface layer is mixed with the subsoil in the plow layer.

If protected from erosion, this soil is suited to row crops, small grain, and hay. Cropping systems that supply organic matter and maintain good tilth are needed. (Capability unit IIe–1; woodland group 1)

Palsgrove silt loam, 6 to 12 percent slopes (PaC).—This soil occurs on ridgetops. The surface layer is thinner and lighter colored than that in the profile described for the series.

If cultivated, this soil is subject to moderate water erosion. Growing crops in alternate strips on the contour slows runoff and limits erosion. Terraces also help to control runoff. (Capability unit IIIe–1; woodland group 1)

Palsgrove silt loam, 6 to 12 percent slopes, moderately eroded (PaC2).—This soil occurs on ridgetops. The surface layer is thinner than that in the profile described for the series, and the depth to bedrock is less. Water erosion has removed all but 3 to 6 inches of the original surface layer. What remains is mixed with the upper part of the subsoil in the plow layer. The present surface layer is lighter colored, lower in organic-matter content, and lower in fertility than an uneroded Palsgrove soil, and it crusts more readily. The depth to clayey material is 20 to 30 inches. Included in mapping were small areas that are severely eroded. The erosion hazard is moderate.

If cultivated, this soil needs careful management for control of erosion. It can be used for row crops, small grain, and hay, but it is not suitable for intensive tillage. (Capability unit IIIe–1; woodland group 1)

Palsgrove silt loam, 12 to 20 percent slopes (PaD).—This soil occurs on side slopes of ridges. The profile is shallower than the one described for the series. The depth to the reddish clay residuum is typically between 30 and 36 inches. In cultivated areas surface runoff is rapid and the erosion hazard is severe.

Because of the slopes, this soil is not suitable for intensive use as cropland. A row crop can be grown occasionally if adequate protection from erosion is provided and management is generally good. Many areas are used as pasture or woodland. (Capability unit IVe–1; woodland group 1)

Palsgrove silt loam, 12 to 20 percent slopes, moderately eroded (PaD2).—This soil occurs on ridgetops. The surface layer and subsoil are thinner than those in the profile described for the series, and the depth to bedrock is less. Water erosion has reduced the thickness of the surface layer to about 4 to 6 inches and has lowered the organic-matter content and impaired the fertility. What remains of the original surface layer is mixed with the upper part of the subsoil in the plow layer. Small areas are severely eroded. The erosion hazard is severe.

If protected from erosion and otherwise well managed, this soil can be used for row crops, small grain, and hay. It is not suitable for intensive cultivation. Cropping systems should consist largely of hay crops. (Capability unit IVe–1; woodland group 1)

Palsgrove silt loam, 12 to 20 percent slopes, severely eroded (PaD3).—Most areas of this soil occur on lower slopes of ridges. The surface layer and subsoil are thinner than those in the profile described for the series, and the depth to bedrock is less. The reddish clay residuum generally is at a depth of 24 to 30 inches. The plow layer is composed mainly of subsoil. The present surface layer is browner and less friable than that in the representative

profile. It is lower in organic-matter content and lower in fertility than that of the moderately and slightly eroded soils, and it crusts more readily. The erosion hazard is very severe.

This soil is not suitable for row crops. Cropping systems should consist largely of hay crops. (Capability unit VIe–1; woodland group 1)

Palsgrove silt loam, 20 to 30 percent slopes (PaE).—This soil occurs on the sides of ridges. The surface layer and subsoil are thinner than those in the profile described for the series, and the depth to bedrock is less.

Because of a very severe erosion hazard, this soil is not suited to row crops. It is well suited to pasture, woodland, and wildlife habitat. Control of grazing is needed to maintain good pasture sod. (Capability unit VIe–1; woodland group 1)

Palsgrove silt loam, 20 to 30 percent slopes, moderately eroded (PaE2).—This soil occurs on the sides of ridges. The surface layer is thinner, browner, lower in organic-matter content, and less friable than that in the profile described for the series, and the depth to bedrock is less. Included in mapping were small areas that are severely eroded.

Because of a very severe erosion hazard, this soil is not suitable for cultivation. It is suitable for use as pasture, as woodland, and as wildlife habitat. Control of grazing is needed to maintain good pasture sod. (Capability unit VIe–1; woodland group 1)

Rockbridge Series

The Rockbridge series consists of well-drained, moderately deep soils on old, high stream benches. These soils formed in a silt mantle, 12 to 36 inches thick, over coarse-textured alluvium. In some places they are underlain by sandstone bedrock. The native vegetation was hardwood forest.

Representative profile of a Rockbridge silt loam, 6 to 12 percent slopes:

0 to 6 inches, dark grayish-brown, friable silt loam.
6 to 8 inches, grayish-brown, friable silt loam.
8 to 20 inches, brown, firm silty clay loam; few chert pebbles.
20 to 35 inches, dark-brown, firm, gravelly silty clay loam; some cobblestones.
35 to 90 inches, dark-brown gravelly loam; some cobblestones.

The number of chert pebbles on the surface and within the soil ranges from many to none. The depth to the gravelly loam substratum ranges from 24 to 40 inches. In some spots, the substratum is sandy.

The natural fertility of these soils is moderate, the moisture-supplying capacity is moderate, permeability is moderate, and the reaction is acid. During extended dry periods, droughtiness is a limitation. Water erosion is a hazard in cultivated areas.

If managed well, these soils are suitable for most of the commonly grown crops. The steeper areas are used mostly for pasture.

Rockbridge silt loam, 6 to 12 percent slopes, moderately eroded (RbC2).—This soil has the profile described for the series. It occurs on bedrock-controlled benches. Included in mapping were a few small areas of slightly eroded soils and a few small areas of severely eroded soils.

Because of the slope and a moderate erosion hazard, this soil is not suitable for intensive cultivation. Row crops can be grown 1 year out of 4 if fertilizer and organic matter are supplied and soil-conserving practices are applied. Lime is generally needed for legumes. (Capability unit IIIe–2; woodland group 1)

Rockbridge silt loam, 12 to 20 percent slopes, moderately eroded (RbD2).—This soil occurs on breaks of bedrock-controlled benches. The surface layer is thinner than that in the profile described for the series, and the depth to the gravelly loam layer is less. The water erosion hazard is severe.

This soil is not well suited to cultivation, but a row crop can be grown occasionally if erosion is controlled. Lime, fertilizer, and organic matter are needed. (Capability unit IVe 2; woodland group 1)

Rozetta Series

The Rozetta series consists of moderately well drained, deep soils on benches along the larger streams. These soils developed in thick deposits of wind-laid and water-laid silt. The native vegetation was mixed hardwood forest.

Representative profile of Rozetta silt loam, benches, 0 to 2 percent slopes:

0 to 11 inches, dark grayish-brown, friable silt loam.
11 to 21 inches, brown, friable silt loam.
21 to 41 inches, brown, firm light silty clay loam; yellowish-brown mottles beginning at a depth of 30 inches.
41 to 60 inches, yellowish-brown, friable silt loam; many large strong-brown and light brownish-gray mottles and a few thin lenses of sand.

The fertility of these soils is moderately high, the moisture-supplying capacity is high, the reaction is strongly acid to slightly acid, and permeability is moderate. The water table is normally at a depth of more than 4 feet. Flooding generally is not a hazard, and surface drainage removes any excess water.

These soils are suited to all crops commonly grown in the county. Most areas are cultivated. Crops respond to proper management.

Rozetta silt loam, benches, 0 to 2 percent slopes (RoA).—This soil has the profile described for the series. It occurs on the broader benches. It often receives large amounts of water from higher areas, and it is somewhat slow to dry out in spring.

Most of this soil is used as cropland. Crops respond well to good management. (Capability unit I–1; woodland group 1)

Rozetta silt loam, benches, 2 to 6 percent slopes (RoB).—This soil occurs on broad benches. The surface layer is thinner than that in the profile described for the series. Runoff is moderate, and water intake is good. Included in mapping were small areas of more than 6 percent slope.

This soil is used mostly as cropland. It is well suited to row crops, small grain, and hay. Practices such as contour stripcropping and terracing help to control erosion. A few isolated areas are used as woodland. (Capability unit IIe–1; woodland group 1)

Sogn Series

The Sogn series consists of well-drained soils that are shallow over dolomite. These soils are generally on the sides and tops of narrow ridges. They formed in a thin layer of silty material that overlies shattered dolomite bedrock.

Representative profile of a Sogn silt loam, stony, 6 to 12 percent slopes:

0 to 7 inches, black, friable stony silt loam.
7 to 12 inches, very dark grayish-brown, friable stony silt loam.
12 inches +, fissured dolomite bedrock.

In some places, dark reddish-brown clay that weathered from dolomite is in cracks in the bedrock. A thin layer of this clay is between the surface layer and the bedrock in some areas. Rocks are on the surface and throughout the profile in many places. In eroded areas, chert fragments occur on and within the surface layer.

The natural fertility of these soils is moderate, the reaction is neutral to moderately alkaline, and the moisture-supplying capacity is very low. The hazard of erosion is severe.

Sogn soils are not suited to cultivated crops but can be used for pasture. They are of limited suitability for trees.

In Vernon County, these soils are mapped only in undifferentiated units with Dunbarton soils.

Sparta Series

The Sparta series consists of excessively drained, deep soils on stream benches. These soils developed in sandy stream outwash. The native vegetation was prairie grass.

Representative profile of a Sparta loamy sand, 2 to 6 percent slopes:

0 to 12 inches, very dark brown, very friable loamy sand.
12 to 17 inches, dark-brown, very friable loamy sand.
17 to 22 inches, brown, very friable sand.
22 to 56 inches, yellowish-brown, loose fine sand.

The natural fertility of these soils is low, the moisture-supplying capacity is very low, and the reaction ranges from slightly acid to strongly acid.

These soils are not well suited to cultivated crops; they are droughty and are subject to wind erosion.

Sparta loamy sand, 0 to 2 percent slopes (SaA).—This soil occurs on low benches in the larger stream valleys. The surface layer, generally 15 to 20 inches thick, is thicker than that in the profile described for the series. Wind erosion is a severe hazard in cultivated areas.

If fertilizer is applied and wind erosion is controlled, this soil can be used for crops that can withstand drought. Lime is needed for legumes. (Capability unit IVs–3; woodland group 4)

Sparta loamy sand, 2 to 6 percent slopes, eroded (SaB2).—This soil occurs on stream benches. The surface layer is thinner than that in the profile described for the series, and the depth to the loose sand substratum is less. The soil is lower in organic-matter content, more droughty, and more susceptible to wind and water erosion than an uneroded Sparta soil. Included in mapping were small areas that are only slightly eroded.

If soil-conserving practices are used and fertilizer and organic matter are applied, this soil can be used occasionally for row crops. Lime may be needed for legumes. Conifer plantations do well on this soil. (Capability unit IVs–3; woodland group 4)

Sparta loamy sand, 6 to 12 percent slopes, eroded (SaC2).—This soil occurs on narrow stream benches and breaks. The surface layer is much thinner than that in the profile described for the series, and the depth to loose sand is less. Included in mapping were small areas that are slightly eroded. The wind erosion hazard is severe.

Droughtiness and the erosion hazard severely limit the use of this soil. Pasture, woodland, and wildlife habitat are suitable uses. Control of grazing is needed in pastures. Conifer plantations do well on this soil. (Capability unit VIs–3; woodland group 4)

Stony Colluvial Land

This land type consists of deposits that consist mainly of sandy and gravelly material but contain variable amounts of silt and an abundance of cobblestones and larger stones. It is on alluvial fans and intermittent stream bottoms. The areas are mostly small and are widely distributed.

This land type has low fertility, a very low organic-matter content, a moderately low moisture-supplying capacity, and an acid reaction. It is subject to flooding and deposition of additional infertile stony overwash.

This land type is not suitable for use as cropland. Many areas are poor, even for pasture.

Stony colluvial land, gently sloping (2 to 6 percent slopes) (ScB).—This land type occurs on fans and in intermittent drainageways and waterways. After intense rain, when the streams are flowing rapidly and often overflowing, coarse material is deposited in drainageways and stream channels are scoured and filled.

This land type is suited to limited use as pasture, woodland, and wildlife habitat. (Capability unit Vw–16; woodland group 13)

Stony colluvial land, sloping (6 to 12 percent slopes) (ScC).—This land type occurs on fans in drainageways and waterways. It is subject to erosion, to flooding, and to deposition of infertile overwash.

A few areas of this land type, mostly those associated with soils better suited to crops, have been used as cropland. Most areas are better suited to pasture, woodland, and wildlife habitat. (Capability unit VIs–6; woodland group 13)

Stony Rock Land

This land type consists of soil material derived from sandstone and dolomite and of outcrops and surface stones of sandstone and dolomite. All of it is moderately eroded, and some areas have shallow gullies. Most areas are lightly forested with hardwoods.

The texture of the surface layer ranges from sandy loam to silt loam. The depth to bedrock generally is less than 24 inches, but in small areas it is between 24 and 42 inches.

The fertility of the soil material is moderately high, and the moisture-supplying capacity is low. The root zone is shallow. Runoff is rapid, and erosion is a hazard unless a vegetative cover is maintained.

This land type is not suitable for cultivation. Good stands of timber grow in the more gently sloping parts and where the soil material is deepest, but in the steeper parts and where the soil material is shallow, the trees are stunted and scattered.

Stony rock land, moderately steep (12 to 20 percent slopes) (SkE).—Most areas of this land type are used as pasture or as woodland. Overgrazing of pasture generally results in the formation of gullies that can encroach upon cropland upslope. Woodland productivity varies, depending on slope and the depth of the soil material. Included in

mapping were small areas of Gale, Norden, Hixton, Dubuque, and Sogn soils. (Capability unit VIs-6; woodland group 13)

Stony rock land, steep (20 to 30 percent slopes) (SkF).—This land type includes bedrock escarpments on valley slopes of the uplands. Most of it occurs as long, narrow areas above areas of Norden and Fayette soils. Included in mapping were small areas of Gale, Norden, Hixton, Dubuque, and Sogn soils.

This land type is of limited use as pasture. Overgrazing encourages the formation of gullies that can encroach upon cropland upslope and discharge harmful overwash onto cropland downslope. Many areas are suitable for trees. Some of the southern exposures are suitable only for wildlife habitat. (Capability unit VIIs-6; woodland group 13)

Stronghurst Series

The Stronghurst series consists of somewhat poorly drained, deep soils on uplands. These soils developed in wind-deposited silt that originated on the Mississippi flood plain.

Representative profile of a Stronghurst silt loam, 2 to 6 percent slopes:

0 to 8 inches, dark-gray, friable silt loam.
8 to 13 inches, brown, firm heavy silt loam.
13 to 20 inches, yellowish-brown, firm light silty clay loam; few reddish-brown mottles.
20 to 40 inches, grayish-brown, firm heavy silt loam; many reddish-brown mottles.
40 to 48 inches, grayish-brown, friable silt loam; many reddish-brown and strong-brown mottles.

The mantle of loess usually is 4 to 6 feet thick but is 12 feet thick or more on some of the nearly level ridgetops. The underlying bedrock is limestone in most areas, but in a few areas it is sandstone.

These soils have a high moisture-supplying capacity and high fertility. Permeability is moderately slow. The water table fluctuates between depths of 4 and 6 feet. The reaction is slightly acid to moderately acid.

If adequately drained, these soils are well suited to most of the commonly grown crops. Seepage areas too wet for cultivation may be suitable for pasture or for wildlife habitat.

Stronghurst silt loam, 2 to 6 percent slopes, moderately eroded (StB2).—This soil occurs in seepage areas on gentle slopes surrounding upland drainageways. The surface layer is thinner and lighter colored than that in the profile described for the series, and the depth to unweathered silt is less. The remaining 4 to 7 inches of the original surface layer is mixed with material from the subsoil into a plow layer that is lower in organic-matter content and has poorer tilth and structure than the original surface layer. Included in mapping were small areas that are slightly eroded.

If protected from further erosion, this soil is well suited to row crops, small grain, and hay. Additions of barnyard manure and fertilizer are needed to improve tilth and maintain fertility. (Capability unit IIw-2; woodland group 7)

Stronghurst silt loam, 6 to 12 percent slopes, moderately eroded (StC2).—This soil occurs in bowl-shaped areas surrounding upland drainageways. The surface layer is thinner than that in the profile described for the series, and the depth to unweathered silt is less. The plow layer is a mixture of surface and subsoil material. It is browner, less friable, and more difficult to till than the original surface layer. The erosion hazard is moderate. Included in mapping were small steep areas.

If erosion is controlled, this soil is suitable for row crops, small grain, and hay. Applications of lime, fertilizer, and barnyard manure improve tilth and productivity. (Capability unit IIIe-8; woodland group 7)

Stronghurst silt loam, benches, 0 to 2 percent slopes (SuA).—This soil occurs on high stream terraces. It includes small depressions that retain water after rain and interfere with tillage. Slow internal drainage in spring delays cultivation. In some places erosion is a slight hazard.

If drained, this soil is well suited to corn, oats, and hay. Alfalfa, in particular, is hard to establish if adequate drainage is not installed. Corn and small grain respond especially well to nitrogen fertilizer that is applied in early spring. In most places lime is needed for legumes. (Capability unit IIw-2; woodland group 7)

Stronghurst silt loam, benches, 2 to 6 percent slopes (SuB).—This soil has slightly better natural drainage than the other Stronghurst soils in this county. The surface layer is slightly thinner than that in the profile described for the series. On the stronger slopes drainage practices may not be needed, but seepage creates a problem. The erosion hazard is slight on the stronger slopes.

If artificially drained and protected from erosion, this soil is suited to corn, small grain, and hay. (Capability unit IIw-2; woodland group 7)

Tama Series

The Tama series consists of well-drained, deep soils on uplands. These soils developed in wind-deposited silt that originated on the Mississippi flood plain.

Representative profile of a Tama silt loam, 2 to 6 percent slopes:

0 to 11 inches, black, friable silt loam.
11 to 16 inches, very dark brown, friable silt loam.
16 to 37 inches, dark-brown, friable heavy silt loam.
37 to 45 inches, dark yellowish-brown, friable heavy silt loam.
45 to 60 inches +, brown, friable silt loam.

The thickness of the silt mantle generally is 4 to 6 feet but is 10 feet or more on some of the broad, nearly level ridgetops. The underlying bedrock is limestone for the most part, but in a few areas it is sandstone.

These soils have high fertility, a high moisture-supplying capacity, and a high organic-matter content. Unless limed, they have a slightly acid to strongly acid reaction.

Tama soils are well suited to the commonly grown crops. Most areas are cultivated.

Tama silt loam, benches, 0 to 2 percent slopes (TaA).—This soil occurs on stream benches. The profile is similar to the one described for the series. The infiltration rate is favorable, the root zone is deep, and the moisture-supplying capacity is high. There are no serious limitations.

This is one of the best soils in the county for farming. Most of it is used for crops. (Capability unit I-1; woodland group 12)

Tama silt loam, benches, 2 to 6 percent slopes (TaB).—This soil occurs on narrow stream benches. The surface layer, generally less than 15 inches thick, is thinner than that in the profile described for the series. This soil is

slightly more susceptible to water erosion than the nearly level phase. Some areas receive runoff from higher slopes.

If well managed, this soil can be used intensively for crops. It is well suited to corn, tobacco, small grain, and hay. Most of it is used as cropland, but a few acres that are inaccessible to tillage are in pasture. (Capability unit IIe–1; woodland group 12)

Tama silt loam, benches, 6 to 12 percent slopes, moderately eroded (TaC2).—This soil occurs on narrow stream benches. The surface layer is thinner and grayer than that in the profile described for the series, and the depth to stratified silt and sand is less. The organic-matter content is lower than that of an uneroded Tama soil. Water erosion is a moderate hazard. Included in mapping were a few small areas that are slightly eroded.

This soil can be cropped fairly intensively if soil-conserving practices are used and organic matter and fertilizer are supplied. (Capability unit IIIe–1; woodland group 12)

Figure 10.—**Profile of Tell silt loam on a high stream bench.**

Tell Series

The Tell series consists of well-drained soils that are moderately deep over sand (fig. 10). These soils are on stream benches. They developed in a silt mantle, 24 to 42 inches thick, over sandy outwash. The native vegetation was hardwood forest.

Representative profile of a Tell silt loam, 2 to 6 percent slopes:

0 to 9 inches, dark grayish-brown, friable silt loam.
9 to 12 inches, grayish-brown, friable silt loam.
12 to 30 inches, brown, firm silty clay loam.
30 to 35 inches, dark-brown, friable sandy clay loam.
35 to 48 inches, strong-brown, loose sand containing chert and sandstone gravel.

The depth to loose sand ranges from 24 to 42 inches but is generally between 30 and 36 inches. The color of the surface layer ranges from very dark grayish brown to grayish brown. Thin layers of sandy loam occur in the subsoil in places.

The natural fertility of these soils is moderate, the moisture-supplying capacity is moderately high, and the reaction is slightly acid to strongly acid. Permeability and internal drainage are moderate, and surface runoff is slow to medium.

These soils are suited to the commonly grown crops, and most of the larger areas are used as cropland.

Tell silt loam, 2 to 6 percent slopes, eroded (TeB2).—This soil occurs on stream benches. The surface layer is thinner and lighter colored than that in the profile described for the series, and the depth to loose sand is less. Tillage operations have mixed a part of the brown subsoil with what remains of the original surface layer. The resulting plow layer is lower in organic-matter content, is more likely to be droughty, is less friable, and has poorer tilth than that of an uneroded Tell soil. The hazard of water erosion is slight to moderate. Included in mapping were small areas of nearly level and gently sloping soils that are slightly eroded.

Under good management, including the use of soil-conserving practices, proper fertilization, and liming where needed, this soil can be used intensively. Applications of barnyard manure improve the structure and tilth. (Capability unit IIe–2; woodland group 1)

Tell silt loam, 6 to 12 percent slopes, moderately eroded (TeC2).—This soil occurs on narrow stream benches. The surface layer is thinner and browner than that in the profile described for the series, and the depth to loose sand is less. Plowing has exposed small areas of the brown subsoil. This soil is more likely to be droughty and more susceptible to water erosion than an uneroded Tell soil. Included in mapping were a few small areas that are slightly eroded. The erosion hazard is moderate.

This soil is not suitable for intensive use as cropland, but row crops can be grown if soil-conserving practices are applied. Applications of lime, fertilizer, and barnyard manure improve structure, tilth, and productivity. (Capability unit IIIe–2; woodland group 1)

Tell silt loam, 12 to 20 percent slopes, moderately eroded (TeD2).—The plow layer of this soil is composed largely of subsoil material. It has poorer tilth and structure than the original surface layer. The depth to loose sand is less than in the profile described for the series. The

erosion hazard is severe. This soil is more likely to be droughty than an uneroded soil of the Tell series. Included in mapping were a few small areas that are slightly eroded and a few that are severely eroded. The erosion hazard is severe.

This soil is not well suited to row crops, but it is well suited to pasture, woodland, and wildlife habitat. A row crop can be grown occasionally if soil-conserving practices are applied. Applications of lime, fertilizer, and barnyard manure improve structure and tilth. (Capability unit IVe-2; woodland group 1)

Terrace Escarpments

Terrace escarpments are long, narrow areas that form the breaks between one terrace and another or between a terrace and the bottom land. They consist of well-drained to excessively drained, light-colored to dark-colored, shallow to deep soils of sandy to silty texture. A few areas are somewhat stony. The hazards of erosion and gullying are severe.

These areas are not suitable for cultivation. Their use is limited mainly to pasture and woodlots.

Terrace escarpments, loamy (20 to 45 percent slopes) (Tr).—This land type consists of terrace breaks. It includes a few areas of terrace soils such as Fayette, benches, Medary, Rockbridge, Tell, and other loamy soils. Soil characteristics and properties generally are variable. Some areas are stony.

This land type is not suitable for cultivated crops but may be used as pasture, as woodland, and as wildlife habitat. (Capability unit VIe-2; woodland group 3)

Terrace escarpments, sandy (12 to 45 percent slopes) (Ts).—This land type consists of terrace breaks. Included in mapping were areas of Dakota, Sparta, and other sandy soils.

Droughtiness and a very severe hazard of water erosion make these areas unsuitable for cultivation. If used for pasture, control of grazing is needed to help maintain a good cover of sod and prevent formation of gullies. They are better suited to use as woodland or as wildlife habitat. (Capability unit VIIs-5; woodland group 4)

Worthen Series

The Worthen series consists of well drained to moderately well drained, deep soils in narrow drainageways, in intermittent stream bottoms, and along the lower slopes of steep hills. These soils developed in local water-deposited silt, more than 40 inches thick, washed down from the adjoining uplands. They are widely distributed throughout the county.

Representative profile of Worthen silt loam, 0 to 2 percent slopes:

0 to 14 inches, black, friable silt loam.
14 to 30 inches, very dark gray, friable silt loam.
30 to 60 inches +, very dark grayish-brown, friable silt loam.

In some areas, large amounts of chert fragments are on the surface and throughout the profile. In most profiles, there are thin layers of lighter colored silt or fine sand. A few areas have a sandy loam surface layer. There are yellow and gray mottles in some areas at a depth of more than 2 feet.

The natural fertility of these soils is high, particularly the nitrogen content. The moisture-supplying capacity is high, the organic-matter content is high, and the reaction is nearly neutral. Flooding occurs during periods of heavy rainfall or of heavy runoff from the adjoining uplands, but the hazard of flooding is slight.

These soils are suited to the commonly grown crops, and the larger areas are cultivated. Floods do little or no damage to crops because the water drains off readily. The smaller areas of these soils are suitable for use as pasture or as wildlife habitat.

Worthen cherty silt loam, 2 to 6 percent slopes (WcB).—This soil occurs in upland drains and on depositional fans below steep drainageways. It is subject to flooding. The profile is like the one described for the series, but there are chert cobblestones on the surface and in the profile. The cobblestones are a hindrance to cultivation.

If protected from flooding, this soil is well suited to all the commonly grown crops. Small isolated areas can be used as pasture or as wildlife habitat. (Capability unit IIe-5; woodland group 12)

Worthen cherty silt loam, 6 to 12 percent slopes (WcC).—This soil occurs in narrow drains and on alluvial fans. It is subject to flooding and to erosion. The profile is similar to the one described for the series, but there are chert cobblestones on the surface and in the profile.

Most areas of this soil are used as pasture. (Capability unit IIIe-5; woodland group 12)

Worthen cherty silt loam, 12 to 20 percent slopes (WcD).—This soil occurs as small areas, generally less than 3 acres in size, on depositional fans. The profile is similar to the one described for the series, but cherty material and large cobblestones occur throughout the profile.

This soil is suitable for use as pasture and as wildlife habitat. The erosion hazard is severe, and the cobblestones and chert make cultivation difficult. (Capability unit IVe-1; woodland group 12)

Worthen silt loam, 0 to 2 percent slopes (WoA).—This soil has the profile described for the series. It occurs in upland drainageways and includes a few small areas of soils that are somewhat poorly drained. (Capability unit I-1; woodland group 12)

Worthen silt loam, 2 to 6 percent slopes (WoB).—This soil occurs on bottom lands and at the base of slopes. Flooding is common. In some places the recent deposits of dark-colored silt are less than 40 inches thick and the profile is underlain by a buried, dark-colored, silty soil that has a light silty clay loam subsoil. Included in mapping were a few small areas of soil with a loam surface. (Capability unit IIe-5; woodland group 12)

Worthen silt loam, 6 to 12 percent slopes (WoC).—This soil occurs in narrow drainageways cut by intermittent watercourses and on fans at the lower end of upland drainageways. Runoff is rapid. In most areas the layer of recently deposited dark-colored silt is less than 40 inches thick and the profile is underlain by a buried, dark-colored, silty soil that has a silty clay loam subsoil. In some places the soil contains some chert fragments. Included in mapping were some small areas of loam.

If cultivated, this soil is subject to flooding and erosion. Small isolated areas are better suited to use as pasture or wildlife habitat than to cultivation. (Capability unit IIIe-5; woodland group 12)

Formation and Classification of the Soils [4]

In this section the formation and classification of the soils are explained, and technical descriptions of the soil profiles are given.

Factors of Soil Formation

The principal factors of soil formation are climate, living organisms, parent material, relief, and time. Climate and living organisms are the active factors. They provide the energy that alters the unconsolidated parent material. Their effects are conditioned by relief, and the total effect of these four factors depends on time.

Climate

Climate influences soil formation directly as the agent that causes the weathering of rock and other parent material and indirectly through its influence on living organisms.

Vernon County has a cool, moist-humid, continental climate, but there are local variations, caused by differences in relief, that are significant enough to result in differences in soil characteristics. For example, south and west slopes are warmer and drier than north and east slopes. Consequently, more rainfall evaporates and less is left to contribute to the weathering of the soil material. Also, the vegetation on the warmer and drier slopes is predominantly grass and that on the north and east slopes is predominantly trees.

Living organisms

Living organisms, both animal and vegetable, affect soil formation by providing organic matter and by transferring plant nutrients from the lower layers of the soil to the upper layers. The native vegetation of Vernon County consisted of oak forest or oak openings, mixed hardwoods, swampland trees and marsh plants, and prairie grass.

In the western part of the county white oak and black oak were predominant. Mixed with these were shagbark hickory, bitternut hickory, maple, basswood, walnut, birch, poplar, elm, and cherry trees. There were also oak openings, in which scattered oaks grew along with an understory of grass.

In the eastern part of the county, east of the West Fork of the Kickapoo River, there were stands of hardwoods, mostly sugar maple and basswood.

Scattered throughout the bottom lands were elm, soft maple, black ash, willow, river birch, and other swampland trees. White pine, red pine, and hemlock grew on valley slopes where the exposure was favorable and the shallow sandy and silty soils were over sandstone bedrock.

The largest area of prairie vegetation was on the main ridge in the west-central part of the county. The native tall grasses were mostly bluestem (*Andropogon* spp.) and needlegrass (*Stipa* spp.)

The soils that formed in the forested areas—for example, the Fayette soils, which are Typic Hapludalfs—are lighter colored and more acid than those that formed where the vegetation was prairie grass—for example, Tama soils, which are Typic Argiudolls. Soils that form under grass accumulate more organic matter and consequently are darker colored than soils that form under forest. Where the vegetation was a mixture of trees and grasses, the soils have some characteristics of forest soils and some characteristics of prairie soils. Downs soils, which are Mollic Hapludalfs, are examples.

Microscopic animal life, earthworms, rodents, and other animals have helped to decompose vegetable matter, have aerated the soil, and have added humus to it.

Man also has influenced the soils. By cultivating the soils, man has lowered or raised the level of acidity and fertility, decreased or increased the amount of humus, and caused or controlled erosion. The continued clearing of woodland, the cultivation of the soil, and the building of water control structures and drainage systems will influence the direction and rate of soil formation.

Parent material

Most of the soils in Vernon County formed in loess underlain with dolomite, sandstone, or alluvium. Some of the soils formed entirely in loess, others partly in loess and partly in the underlying material.

Vernon County is within the unglaciated part of Wisconsin, which is known as the Driftless Area. Loess covers most of the county. It is wholly or in part the parent material of most of the soils on the uplands. The loess is generally thickest on the level or nearly level uplands. Here it is 30 to 100 inches deep, and Fayette, Tama, Lindstrom, and Downs soils (fig. 11 and fig. 12) are predominant. Peripheral to these deeper soils, and generally adjacent to the marginal breaks of steep stony land, are Dubuque, Norden, and Gale soils (fig. 12 and fig. 13). Dubuque soils formed in loess over dolomite, Norden soils in loess over glauconitic sandstone, and Gale soils in loess over nonglauconitic sandstone. The lower part of the Norden and Gale soils formed in the residuum of the parent rock. Beyond these soils are steeper slopes and areas along streams, where the loess is thinner. Dunbarton and Sogn soils formed in these areas (fig. 11).

Where the loess has been removed, the parent material is unconsolidated, partly weathered rock. Hixton soils, the largest areas of which are in the eastern part of the county, formed in weathered sandstone (fig. 13).

Local alluvium from the uplands is the parent material of most of the soils on the terraces and flood plains of the streams east of the Mississippi River flood plain. Where the streams have built a succession of terraces, the higher terraces are the earlier deposits. The lower terraces are still receiving deposits from periodic overflows. The age of many of the terraces is masked, however, by later deposits of loess. Fayette, Stronghurst, Rozetta, Tama, Muscatine, and Tell soils formed on these silt-mantled terraces (fig. 14). They are extensive along Coon Creek, the Bad Axe River, and the West Fork of the Kickapoo River. The more recently formed terraces are along large streams, especially the Mississippi River and the lower reaches of Coon Creek and the forks of the Bad Axe River. On these more recent, lower terraces are the Dakota soils and the weakly developed Sparta soils.

The alluvial soils, which include Arenzville, Orion, Huntsville, Boaz, and Lawson soils, are along all major streams (fig. 15). In the upland drainageways are colluvial-alluvial deposits in which Chaseburg and Worthen soils are forming.

[4] By PAUL H. CARROLL, soil correlator, Soil Conservation Service, Madison, Wisconsin.

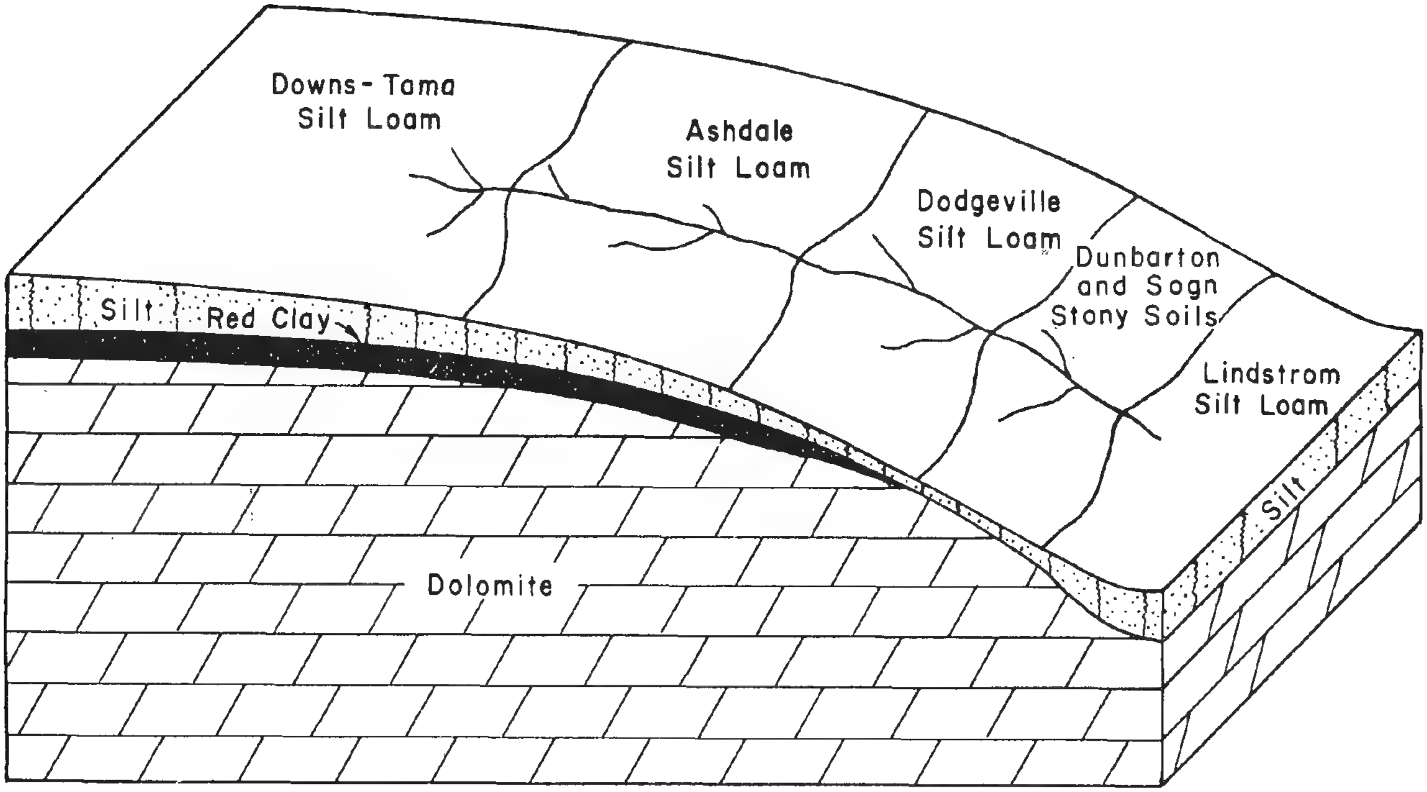

Figure 11.—Major soils, landforms, and underlying material on uplands underlain with dolomite.

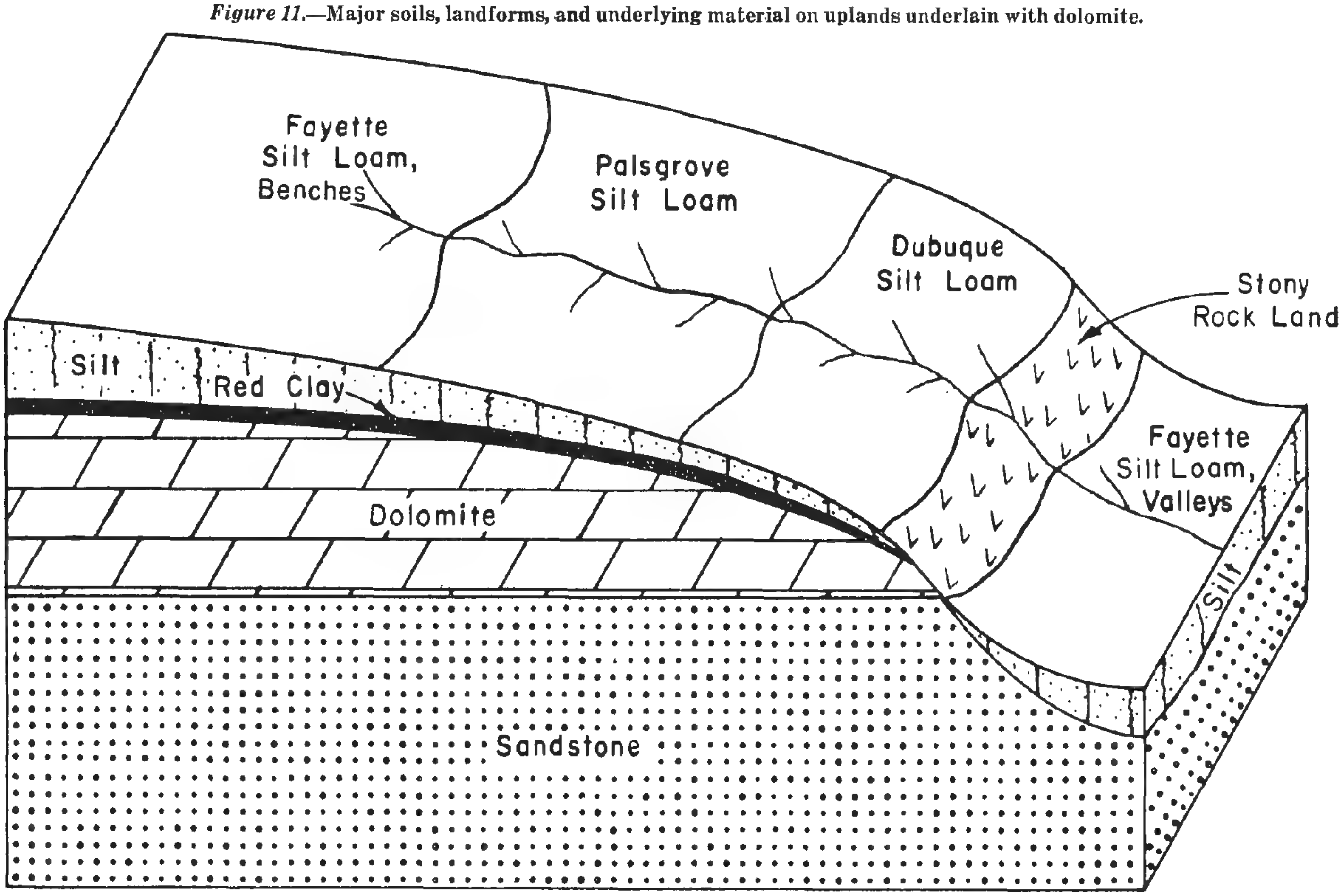

Figure 12.—Major soils, landforms, and underlying material on uplands underlain with dolomite and sandstone.

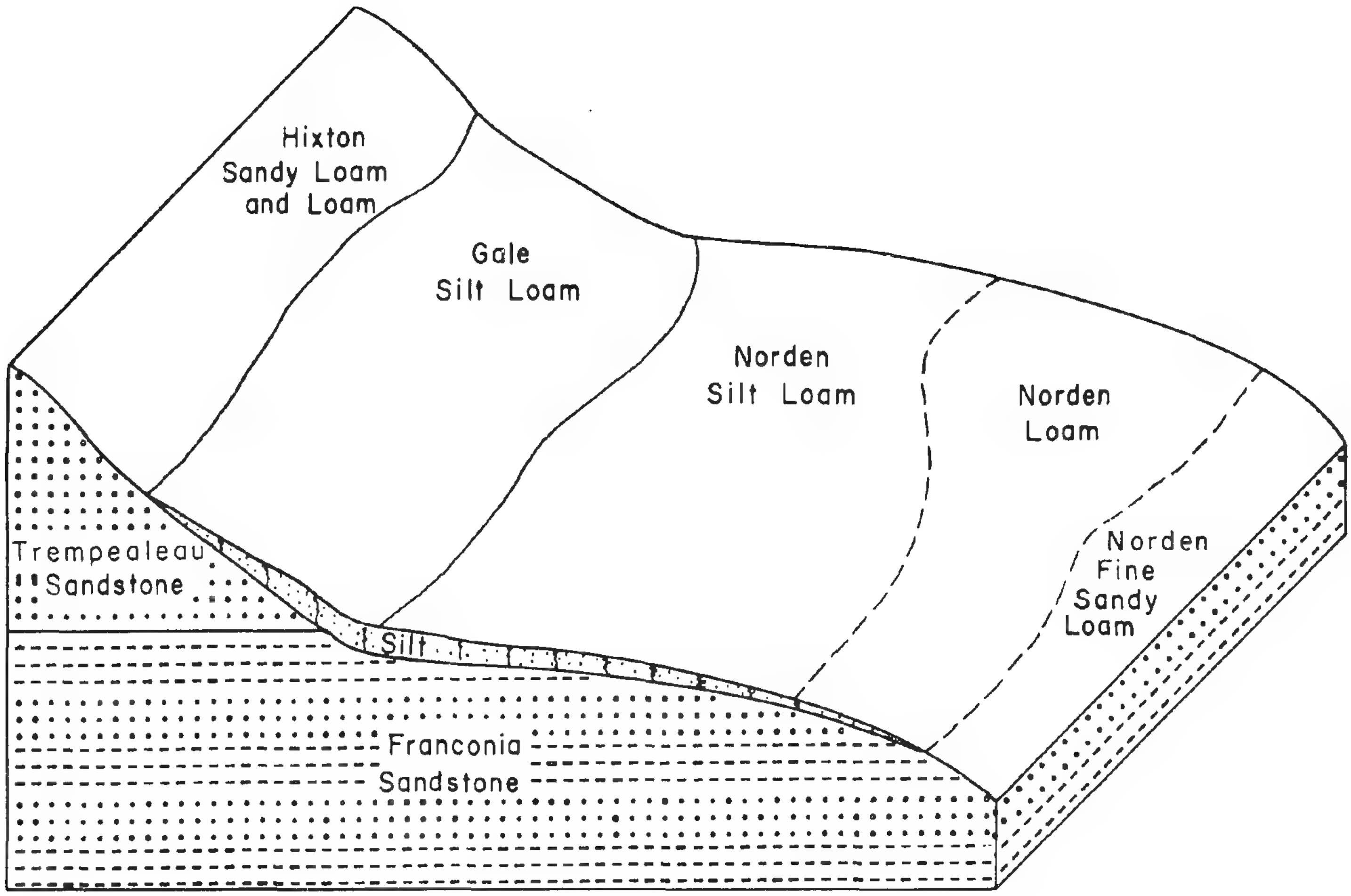

Figure 13.—**Major soils, landforms, and underlying material on uplands underlain with sandstone.**

In depressions on flood plains there are small areas of organic material consisting of sedges and grasses in various stages of decomposition. Houghton soils are in these areas.

Relief

Relief affects drainage, erosion, organic-matter content, and depth of soil, and thereby it influences soil formation. Through its effect on drainage, relief helps to determine the depth and color of a soil profile. The more steeply sloping soils are lighter colored and shallower than the more gently sloping soils. The nearly level to sloping or steep Ashdale, Dakota, Fayette, Dubuque, Gale, Hixton, Norden, Downs, Tama, and Lindstrom soils are well drained and are free of mottling in the A and B horizons. The level to gently sloping Rozetta soils are moderately well drained and are mottled in the lower B and C horizons. The very poorly drained Ettrick soils, in depressions on low stream terraces and bottom lands, are gleyed. Level or nearly level soils take in a large amount of water, which increases plant growth and builds up humus. Thus, dark-colored, organic soils form.

The effect of relief upon soil depth is shown in Sogn and Ashdale soils. Both formed in the same kind of parent material, but the more strongly sloping Sogn soils lack the B horizon development of the Ashdale soils.

Time

Climate and living organisms, the active soil-forming agents, require time to form soil from parent material. The length of time depends upon other soil-forming factors. The loessal material that covers most of Vernon County probably was deposited 11,000 years ago. Fayette, Tama, Downs, and other soils that are entirely in loess probably began forming at this time. Norden and Gale soils, which formed partly in residuum of bedrock, may be much older than the other loessal soils.

Some of the soils consist of recently deposited material and have little if any profile development. Examples of these are Boone, Arenzville, Chaseburg, Worthen, Huntsville, Lawson, and Orion soils.

The age of the soils on high stream terraces is difficult to determine because winds have blanketed the terraces as well as the uplands with silt. Generally the water-deposited material on the higher terraces is considered old alluvium, and that on the lower terraces youthful, or recent, alluvium. Fayette, Rozetta, Stronghurst, Tama, and Muscatine are among the soils that formed in old terrace

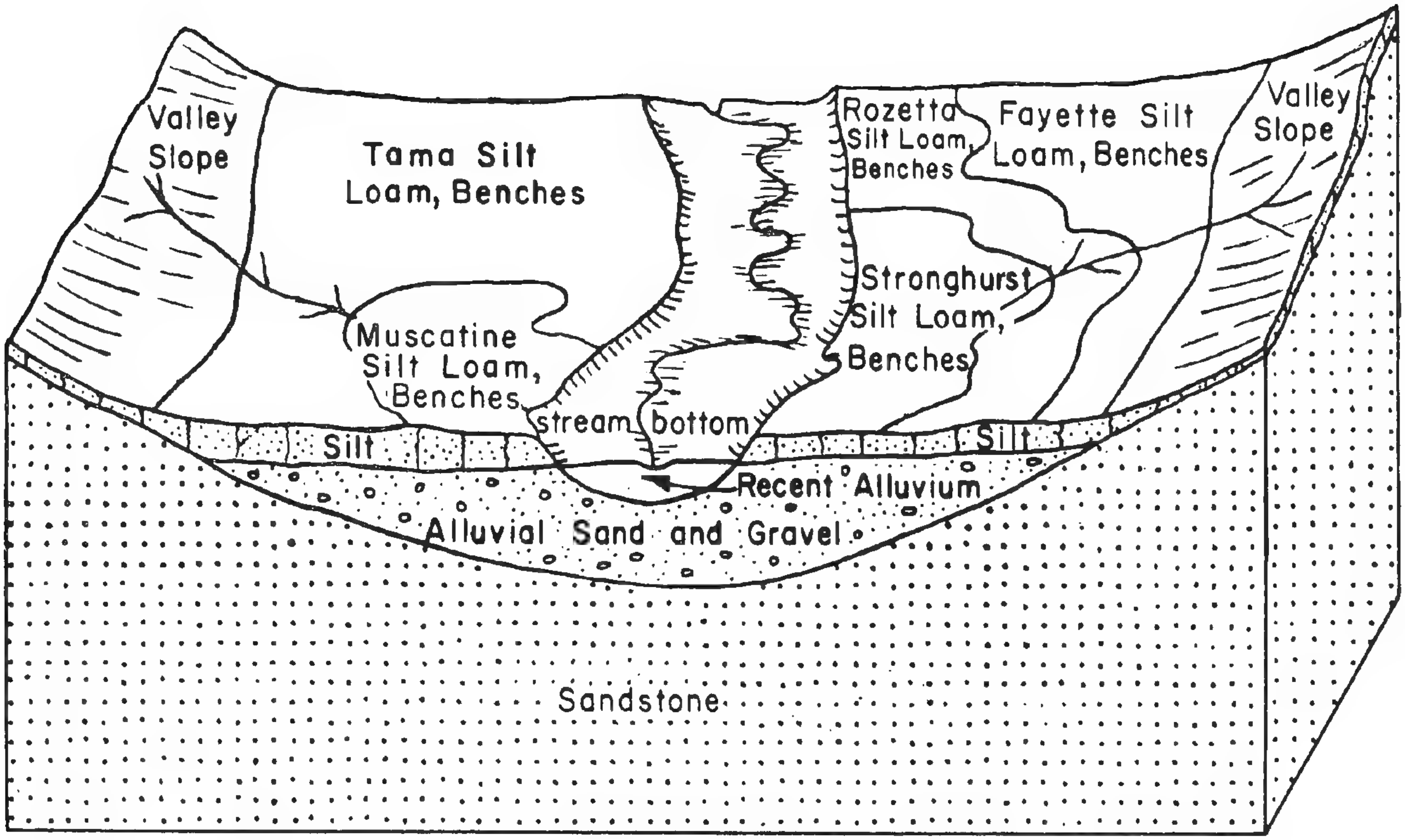

Figure 14.—**Major soils, landforms, and underlying material on the silt-mantled terraces.**

alluvium. Dakota and Sparta soils are on the lower terraces.

Processes of Horizon Differentiation

Differentiation of horizons in the soils of Vernon County is the result of one or more of the following: accumulation of organic matter, leaching of carbonates and salts, translocation of silicate clay minerals, and reduction and transfer of iron.

Enough organic matter to form an A1 horizon has accumulated in the uppermost part of all but a few of the soils in the county. The quantity varies. The Boone soils, for example, have a faint, thin A1 horizon that is low in organic-matter content, but the Sparta, Tama, Dakota, and some other soils have a thick A1 horizon that is fairly high in organic-matter content. Much of the organic matter is in the form of humus.

Leaching of carbonates and salts has occurred in almost all of the soils. Its visible effect on horizon differentiation has been limited, but it has had an indirect effect in that it has facilitated the translocation of silicate clay minerals in some soils. Free carbonates and salts have been almost completely removed from the profiles of some of the well-drained soils. Even in the wettest soils, through which water moves very slowly, some leaching is indicated by the absence of free carbonates and an acid reaction.

The translocation of silicate clay minerals has contributed to the development of horizons in many soils of Vernon County. In Fayette, Palsgrove, Gale, and other deep loessal soils on mature uplands, silicate clay has accumulated in an illuvial B horizon that contains more total clay and more fine clay than the horizons above or below. In Dubuque and other shallow loessal soils, however, where the B horizon formed partly in underlying dolomite residuum, the illuvial horizon contains no more total clay than the underlying C, but it does contain more fine clay. Nearly all of the soils that have a blocky structure have clay films, some of which are thin and weakly expressed. The films occur as thin layers on ped faces, and the long axes of the clay particles lie parallel with the surface on which they are deposited. This translocated clay, where strongly expressed, fills the cracks of the soil and the crevices and openings left by plant roots and animals or insects.

The horizon from which clay has been removed is identified in these soils by its bleached appearance, friable consistence, and generally platy structure.

Nearly structureless soils, such as Worthen soils, have a slight accumulation of silicate clay in the B horizon. They do not have clay films on ped surfaces, however, because they have no peds with prominent cleavage planes, nor have they been subjected to intensive or prolonged weathering. The clay in the illuvial horizon of these soils

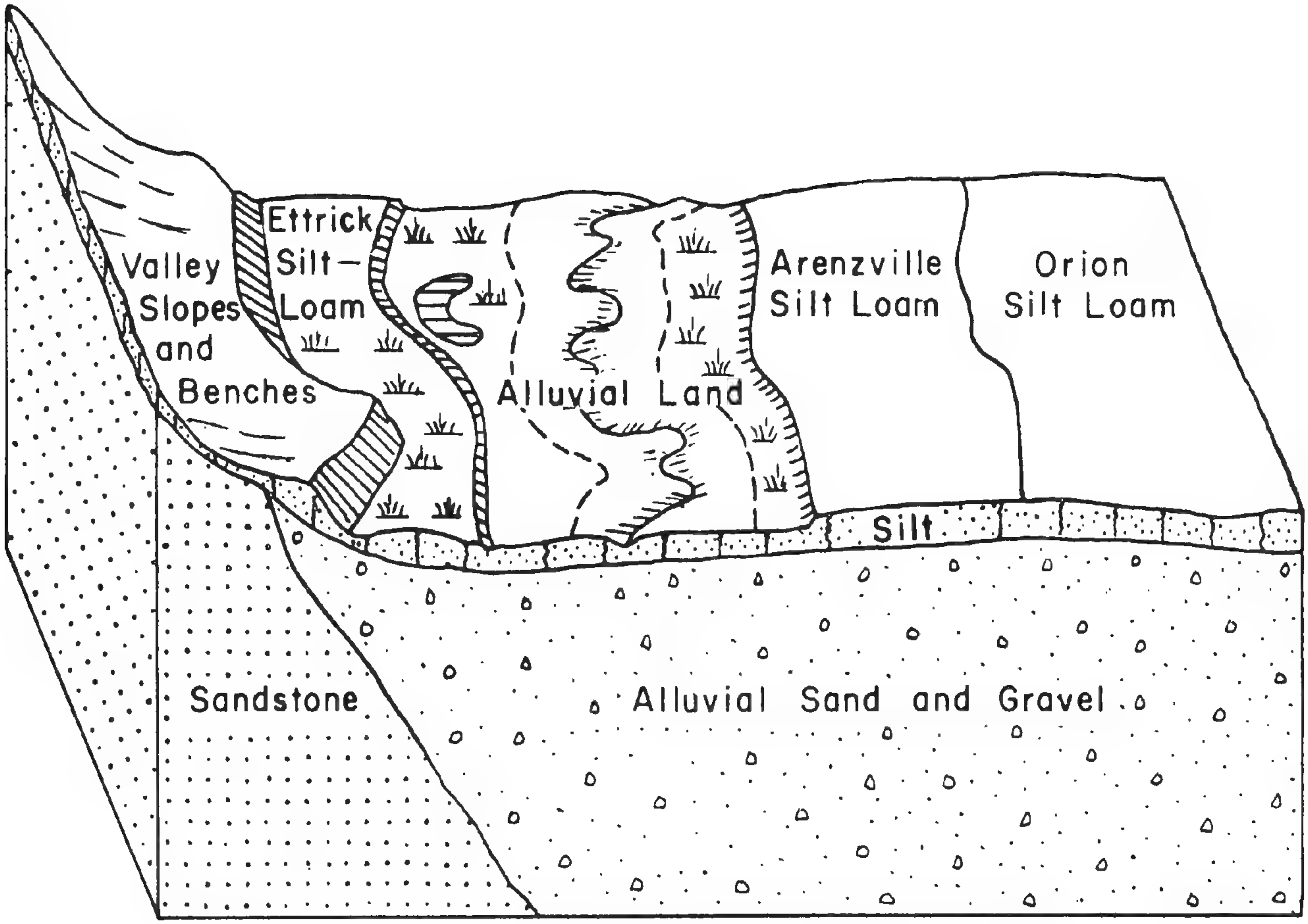

Figure 15.—**Major soils, landforms, and underlying material along the major streams.**

generally occurs as a coating on the individual sand grains and is parallel with the surface of the grain. A few pores in this horizon have weak, discontinuous clay films.

The reduction and transfer of iron oxides has occurred in all of the very poorly drained, poorly drained, and somewhat poorly drained soils. This process, called gleying, is most pronounced in the Ettrick soils. It is indicated by a gray color in the subsurface horizons. After iron has been reduced, it may be removed completely from the soil profile. More commonly, in Vernon County, it has moved a short distance and stopped either in the horizon of its origin or in an adjoining horizon. Segregated iron forms yellowish-red, strong-brown, or yellowish-brown mottles. Black manganese spots also are common.

Classification of the Soils

The current system of soil classification was adopted for general use by the National Cooperative Soil Survey in 1965 (*5*). It is still under study and revision. Readers interested in development of the system should refer to the latest literature available (*3*).

This system of classification has six categories. Beginning with the broadest, they are the order, the suborder, the great group, the subgroup, the family, and the series. In table 7 the soil series are classified by family, subgroup, and order.

The soil orders are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties that differentiate the orders are those that give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates.

In Vernon County only the Entisols, Inceptisols, Mollisols, Alfisols, and Histosols are represented. Entisols are recent soils. They have no genetic horizons or have only the beginnings of such horizons. Inceptisols generally are on young but not recent land surfaces. Mollisols generally form under grass vegetation. They have a thick, dark-colored surface layer called a mollic epipedon. Alfisols have a clay-enriched B horizon high in base saturation. Histosols are accumulations of decomposed or partly decomposed plant residue.

TABLE 7.—*Classification of the soils*

Series	Family	Subgroup	Order
Arenzville	Coarse-silty, mixed, nonacid, mesic	Typic Udifluvent	Entisol.
Ashdale	Fine-silty, mixed, mesic	Typic Argiudoll	Mollisol.
Boaz	Fine-silty, mixed, nonacid, mesic	Aeric Haplaquept	Inceptisol.
Boone	Sandy, uncoated, siliceous, mesic	Typic Quartzipsamment	Entisol.
Chaseburg	Coarse-silty, mixed, nonacid, mesic	Typic Udifluvent	Entisol
Dakota	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Argiudoll	Mollisol.
Dodgeville	Fine-silty over clayey, mixed, mesic	Typic Argiudoll	Mollisol.
Downs	Fine-silty, mixed, mesic	Mollic Hapludalf	Alfisol.
Dubuque	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Dunbarton	Clayey, montmorillonitic, mesic	Lithic Hapludalf	Alfisol.
Ettrick	Fine-silty, mixed, noncalcareous, mesic	Typic Argiaquoll	Mollisol.
Fayette	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Gale	Fine-silty over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalf	Alfisol.
Hixton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalf	Alfisol.
Houghton	(1)	(1)	Histosol.
Huntsville	Fine-silty, mixed, mesic	Cumulic Hapludoll	Mollisol.
Kickapoo	Coarse-loamy, mixed, nonacid, mesic	Typic Udifluvent	Entisol.
Lawson	Fine-silty, mixed, mesic	Cumulic Hapludoll	Mollisol.
Lindstrom	Fine-silty, mixed, mesic	Cumulic Hapludoll	Mollisol.
Medary	Fine, mixed, mesic	Typic Hapludalf	Alfisol.
Muscatine	Fine-silty, mixed, mesic	Aquic Argiudoll	Mollisol
Norden	Fine-loamy, mixed, mesic	Typic Hapludalf	Alfisol.
Norwalk	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Orion	Coarse-silty, mixed, nonacid, mesic	Aquic Udifluvent	Entisol.
Orion, wet variant	Fine-silty, mixed, nonacid, mesic	Typic Haplaquent	Entisol.
Palsgrove	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Rockbridge	Fine-silty over fragmental, mixed, mesic	Typic Hapludalf	Alfisol.
Rozetta	Fine-silty, mixed, mesic	Typic Hapludalf	Alfisol.
Sogn	Loamy, mixed, mesic	Lithic Hapludoll	Mollisol.
Sparta	Sandy, mixed, mesic	Entic Hapludoll	Mollisol.
Stronghurst	Fine-silty, mixed, mesic	Aeric Ochraqualf	Alfisol.
Tama	Fine-silty, mixed, mesic	Typic Argiudoll	Mollisol.
Tell	Fine-silty over sandy or sandy-skeletal, mixed, mesic	Typic Hapludalf	Alfisol.
Worthen	Fine-silty, mixed, mesic	Cumulic Hapludoll	Mollisol.

[1] Not placed in a family or subgroup.

Orders are divided into suborders, mainly on the basis of characteristics that reflect genetic similarity. The soil properties that separate the suborders are mainly degree of wetness, differences resulting from climate or vegetation, or differences in texture.

Suborders are divided into great groups on the basis of uniformity in the kinds and sequence of major horizons and features. The horizons are those in which clay, iron, or humus has accumulated or those that have a pan that interferes with growth of roots or movement of water. The soil features are soil temperature, chemical composition, and the self-mulching properties of clay.

Great groups are divided into subgroups, one representing the central, or typic, concept of the group and others, called intergrades, that have properties grading toward those of another great group, suborder, or order.

Families are established within subgroups mainly on the basis of soil properties important to the growth of plants or on the basis of the behavior of the soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

The classification of soils at the series level and lower is discussed in the section "How This Survey Was Made."

Technical descriptions of each of the soil series correlated in Vernon County follow.

ARENZVILLE SERIES

The Arenzville series consists of well drained to moderately well drained, medium-textured soils that formed in deep, silty recent alluvium on flood plains of major streams. In most places the alluvium overlies a dark-colored, buried soil. The color, thickness, and number of layers in the profile vary with the rate and amount of deposition.

These soils are members of a coarse-silty, mixed, nonacid, mesic family of Typic Udifluvents.

Representative profile of Arenzville silt loam in the NE¼NE¼SW¼ sec. 31, T. 14 N., R. 3 W.:

A11—0 to 4 inches, very dark grayish-brown (10YR 3/2) silt loam, stratified; weak, thin, platy structure; friable; plentiful roots; mildly alkaline; clear, smooth boundary.

A12—4 to 36 inches, very dark grayish-brown (10YR 3/2) silt loam, stratified; weak to moderate, thin, platy structure; friable; few roots; ½-inch to 1½-inch seams of very dark grayish-brown (10YR 3/2) very fine sand and fine sand; few, fine, distinct, brown (7.5YR 4/4) mottles beginning at a depth of 20 inches; neutral; clear, smooth boundary.

A13—36 to 40 inches, stratified very dark gray (10YR 3/1) and very dark brown (10YR 2/2) silt loam; weak, thin, platy structure; friable; few, fine, distinct, dark-brown (7.5YR 3/2) mottles; neutral; clear, smooth boundary.

A1b—40 to 60 inches, black (10YR 2/1) silt loam; massive; friable; few, fine, distinct, dark-brown (7.5YR 3/3) mottles; neutral.

The depth to the A1b horizon ranges from 18 to 42 inches. There is generally some mottling in the lower part of the profile, and in some places there is mottling in the solum. The reaction is neutral to mildly alkaline.

Arenzville soils are lighter colored than Huntsville soils but are similar in texture and occupy like positions in the landscape. They are more stratified than Chaseburg soils, which are not underlain by a buried soil and which have a weakly developed B horizon in many areas. Arenzville soils form a drainage catena with the somewhat poorly drained and poorly drained Orion soils.

Ashdale Series

The Ashdale series consists of well drained, silty soils on the broad west-central ridge. These soils formed partly in loess 30 to 50 inches thick and partly in the underlying red clay residuum derived from dolomite bedrock. About one-third of the solum formed in the clayey residuum. The native vegetation was prairie grass.

Ashdale soils are members of a fine-silty, mixed, mesic family of Typic Argiudolls.

Representative profile of Ashdale silt loam in the SW¼ SW¼ sec. 28, T. 12 N., R. 4 W.:

Ap—0 to 7 inches, very dark brown (10YR 2/2) silt loam; weak, fine to medium, granular structure; friable; abundant roots; slightly acid; gradual, wavy boundary.

A12—7 to 13 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; friable; abundant roots; slightly acid; gradual, wavy boundary.

A3—13 to 18 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; abundant roots; medium acid; clear, wavy boundary.

B1—18 to 25 inches, dark yellowish-brown (10YR 3/4) heavy silt loam; moderate, fine to medium, subangular blocky structure; friable to firm; plentiful roots; medium acid; clear, wavy boundary.

B21t—25 to 31 inches, brown (7.5YR 4/4) silty clay loam; moderate, fine, subangular blocky structure; firm; plentiful roots; moderate amounts of chert fragments 1/16 inch to 4 inches in diameter; medium acid; clear, wavy boundary.

IIB22t—31 to 40 inches, yellowish-red (5YR 5/8) and strong-brown (7.5YR 5/8) silty clay; strong, fine, subangular blocky structure; very firm; few roots; coarse and very coarse cherty sand; medium acid; clear, wavy boundary.

IIC—40 to 55 inches, red (2.5YR 4/8) clay; weak, medium, subangular blocky structure; medium acid.

In some places the Ap and A12 horizons are black (10YR 2/1).

Ashdale soils occur with Dodgeville and Tama soils. They differ from Dodgeville soils in having more of the solum formed in loess and from Tama soils in having the lower part of the solum at a depth of less than 50 inches formed in clayey residuum. Ashdale soils are similar to Palsgrove soils in depth and in kind of parent material but have a thicker, darker surface layer and lack an A2 horizon.

Boaz Series

The Boaz series consists of deep, somewhat poorly drained silty soils that formed in alluvium washed down from the loess-mantled uplands.

Boaz soils are members of a fine-silty, mixed, nonacid, mesic family of Aeric Haplaquepts.

Representative profile of Boaz silt loam in the NW¼ SE¼ sec. 33, T. 12 N., R. 3 W., 100 feet south of road:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure; friable; many roots and pores; medium to slightly acid; abrupt, smooth boundary.

A2—9 to 16 inches, dark grayish-brown (10YR 4/2) silt loam; many, medium, prominent, yellowish-red (5YR 5/8) mottles; moderate, medium, platy structure; friable; many roots and pores; medium acid; gradual, wavy boundary.

B1g—16 to 36 inches, stratified grayish-brown (2.5Y 5/2) or light brownish-gray (2.5Y 6/2) silt loam; many, medium, faint and prominent, yellowish-red (5YR 5/8) mottles; massive; friable when moist, slightly sticky and slightly plastic when wet; few roots or pores; medium acid; gradual, wavy boundary.

B2g—36 to 42 inches, stratified grayish-brown (2.5Y 5/2) to light brownish-gray (2.5Y 6/2) silty clay loam; many, medium, prominent, yellowish-red (5YR 5/8) mottles; massive; firm when moist, plastic when wet; no roots, but a few pores; strongly acid to medium acid; gradual, wavy boundary.

Cg—42 to 60 inches, stratified light brownish-gray (2.5Y 6/2) and yellowish-red (5YR 4/8 to 5/8) silty clay loam in about equal parts; massive; dense; plastic when wet; strongly acid.

In some areas there are thin lenses of fine sand in the profile. Also, in some areas the substratum at a depth greater than 3 feet consists of stratified silty, sandy, and clayey material. Thin deposits of more recent silty material overlie the A horizon in places.

Boaz soils occur with Arenzville, Ettrick, and Orion soils on high bottoms. They have a finer textured subsoil than Arenzville or Orion soils. They are lighter colored and somewhat better drained than Ettrick soils. Boaz soils are somewhat similar to Stronghurst soils but lack the strong subsoil development.

Boone Series

The Boone series consists of shallow to moderately deep, excessively drained sandy soils that formed in residuum of sandstone bedrock. These soils occupy escarpments of valley slopes and sandstone outcrops on ridges. The slopes are moderately steep and steep.

Boone soils are members of a sandy, uncoated, siliceous, mesic family of Typic Quartzipsamments.

Representative profile of Boone loamy sand in the NE¼NE¼ sec. 17, T. 12 N., R. 4 W., 300 feet south and 100 feet west of intersection of town road with old U.S. Highway 14:

A11—0 to 4 inches, very dark grayish-brown (10YR 3/2) loamy sand; single grain; loose; many roots; strongly acid; clear, smooth boundary.

C1—4 to 10 inches, yellowish-brown (10YR 5/4) sand; single grain; loose; many roots; strongly acid; clear, smooth boundary.

C2—10 to 15 inches, light brownish-gray (10YR 6/2) sand; single grain; loose; few roots; strongly acid; clear, smooth boundary.

C3—15 to 25 inches, light yellowish-brown (10YR 6/4) sand; single grain; loose; few roots; medium acid; clear, smooth boundary.

IIR—25 inches, very pale brown (10YR 7/4) and white (10YR 8/2) banded sandstone bedrock; medium acid.

The depth to sandstone bedrock ranges from 1 foot to more than 4 feet.

Boone soils are coarser textured throughout their profile than Hixton soils and lack the textural B horizon that Hixton soils have.

Chaseburg Series

The Chaseburg series consists of deep, well drained to moderately well drained silty soils that formed in alluvial silt more than 40 inches thick in drainageways, on alluvial fans, and on foot slopes scattered throughout the

county. These soils have a weakly developed profile. The native vegetation was deciduous forest.

Chaseburg soils are members of a coarse-silty, mixed, nonacid, mesic family of Typic Udifluvents.

Representative profile of Chaseburg silt loam in the SE¼NE¼ sec. 20, T. 13 N., R. 6 W., 150 feet north of road and 80 feet west of stream:

A1—0 to 28 inches, very dark grayish-brown (10YR 3/2) silt loam in the uppermost 5 inches, dark grayish-brown (10YR 4/2) below a depth of 5 inches, and brown (10 YR 5/3) in the lower part; moderate, thin, platy structure; friable; many roots and pores; neutral; clear, wavy boundary.

C1—28 to 35 inches, brown (10YR 5/3) silt loam; few, fine, faint, dark-brown (7.5YR 4/4) mottles; weak to moderate, medium, platy structure; friable; many roots and pores; slightly acid; clear, wavy boundary.

C2—35 to 60 inches, yellowish-brown (10YR 5/4) silt loam; structureless; friable; few fine roots and many pores; medium to slightly acid.

In areas that have been cultivated, the Ap horizon has weak, fine, granular, subangular blocky, or platy structure.

Chaseburg soils are in positions similar to those of Worthen soils but are lighter colored. They are less stratified than Arenzville soils and lack the buried, dark-colored soil.

Dakota Series

The Dakota series consists of well-drained, nearly level to sloping sandy loams that are moderately deep over sand. These soils formed in sandy or loamy outwash on stream terraces.

Dakota soils are members of a fine-loamy over sandy or sandy-skeletal, mixed, mesic family of Typic Argiudolls.

Representative profile of Dakota sandy loam in the SW¼SW¼ sec. 25, T. 12 N., R. 3 W.:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) sandy loam with very weak, fine, subangular blocky structure; friable; few roots; neutral; abrupt, smooth boundary.

A1—7 to 12 inches, very dark grayish-brown (10YR 3/2) sandy loam; very weak, thick, platy structure; friable; few roots; neutral; clear, smooth boundary.

A3—12 to 16 inches, about equal parts of very dark grayish-brown (10YR 3/2) and brown (10YR 4/3) sandy loam; very weak, thick, platy structure breaking to very weak, medium, subangular blocky structure; friable; neutral; gradual, smooth boundary.

B2t—16 to 24 inches, brown (7.5YR 4/4) heavy sandy loam; weak, medium to coarse, subangular blocky structure; thin, patchy clay films; friable; neutral; gradual, smooth boundary.

B3—24 to 34 inches, dark yellowish-brown (10YR 4/4) sandy loam; very weak, medium, subangular blocky structure; very friable; neutral; gradual, smooth boundary.

C—34 to 48 inches, yellowish-brown (10YR 5/6) fine sand; single grain; loose; slightly acid.

The thickness of the A horizon ranges from 9 to 24 inches. In uncultivated areas the color of the A1 horizon is very dark brown (10YR 2/2). The depth to loose sand ranges from 24 to 36 inches.

Dakota soils are associated with Sparta soils but formed in somewhat finer textured material and have a thicker solum.

Dodgeville Series

The Dodgeville series consists of well-drained silty soils that are mostly on the broad west-central ridge. These soils are shallow to moderately deep over clay. They formed partly in loess 15 to 30 inches thick and partly in the underlying red clay residuum of dolomitic limestone. The slopes are convex.

Dodgeville soils are members of a fine-silty over clayey, mixed, mesic family of Typic Argiudolls.

Representative profile of Dodgeville silt loam in the NE¼SW¼ sec. 25, T. 13 N., R. 5 W.:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; abundant roots; slightly acid; gradual, wavy boundary.

A3—8 to 14 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; abundant roots; slightly acid; gradual, wavy boundary.

B1t—14 to 18 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, fine, subangular blocky structure; firm; plentiful roots; few chert fragments from ⅛ inch to 1½ inches in size; medium acid; clear, wavy boundary.

IIB2t—18 to 24 inches, reddish-brown (5YR 4/3) silty clay; moderate to strong, medium, subangular blocky structure; sticky; few roots; numerous chert fragments from ½ inch to 6 inches in size; medium acid; gradual, wavy boundary.

IIC—24 to 60 inches, yellowish-red (5YR 4/6) to dark reddish-brown (5YR 3/4) clay; massive; sticky; few roots; more than 50 percent chert fragments ranging from ½ inch to more than 6 inches in size; medium acid.

In uncultivated areas, the A1 horizon is generally black (10YR 2/1). The IIB2 horizon, or about one-third to two-thirds of the solum, formed in dolomitic clay residuum. In some places the C horizon is yellowish red (5YR 4/6).

Dodgeville soils have a darker colored, thicker surface horizon than Dubuque soils. They are associated with Ashdale soils but formed in shallower silt, generally less than 20 inches thick.

Downs Series

The Downs series consists of deep, well-drained, silty soils on broad upland ridges. These soils formed in a mantle of loess more than 48 inches thick, under prairie grass and hardwoods. The slopes are somewhat convex and range from nearly level to moderately steep.

Downs soils are members of a fine-silty, mixed, mesic family of Mollic Hapludalfs.

Representative profile of Downs silt loam in the SE¼SE¼ sec. 4, T. 13 N., R. 4 W.:

Ap—0 to 7 inches, very dark gray (10YR 3/1) silt loam; weak to moderate, granular structure; friable; abundant roots; neutral; clear, wavy boundary.

A2—7 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure; friable; plentiful roots; slightly acid; clear, wavy boundary.

A3—11 to 14 inches, dark-brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; plentiful roots; medium acid; clear, wavy boundary.

B1t—14 to 21 inches, brown (10YR 4/3) heavy silt loam; weak, medium, subangular blocky structure; friable to firm; plentiful roots; slightly vesicular; few clay films and organic stains in root channels; a few worm casts; medium acid; clear, wavy boundary.

B2t—21 to 31 inches, brown (10YR 4/3) light silty clay loam; moderate, medium, subangular blocky structure; firm; few roots; moderately vesicular; small amounts of bleached silt and a few clay films on ped surfaces; medium acid; clear, wavy boundary.

B3t—31 to 45 inches, yellowish-brown (10YR 4/4) heavy silt loam; weak, coarse, subangular blocky structure; friable; few roots; slightly vesicular; small amounts of bleached silica dust and a few clay films on vertical faces of peds; few organic stains; medium acid; clear, wavy boundary.

C—45 to 60 inches, yellowish-brown (10YR 5/4) silt loam; massive; friable; few roots; very dark grayish-brown (10YR 3/2) color along fine root channels; few, fine, faint, yellowish-brown (10YR 5/8) mottles at a depth of about 60 inches; medium acid.

The depth to bedrock ranges from 4 to 6 feet. The bedrock is generally limestone, but it is sandstone in some places.

Downs soils have a thicker, slightly darker colored surface layer than Fayette soils and a less strongly developed subsoil. They are intermingled with Tama soils and generally have a thinner, somewhat lighter colored surface layer.

Dubuque Series

The Dubuque series consists of moderately deep, well-drained soils that formed in loess 15 to 30 inches thick over residuum of dolomite underlain by fissured dolomite. These soils are on ridge crests near the Mississippi River where the loss mantle is thickest. The shallow Dubuque soils are generally steeper and stony.

Dubuque soils are members of a fine-silty, mixed, mesic family of Typic Hapludalfs.

Representative profile of Dubuque silt loam in the SW¼NE¼ sec. 15, T. 12 N., R. 3 W.:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, very fine and fine, subangular blocky structure; friable; abundant roots; neutral; clear, wavy boundary.

A2—7 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; abundant roots; neutral; clear, smooth boundary.

B1—8 to 12 inches, brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; friable; plentiful roots; slightly acid; clear, wavy boundary.

B21t—12 to 16 inches, brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm; thin, discontinuous clay films; plentiful roots; medium acid; clear, wavy boundary.

IIB22t—16 to 32 inches, reddish-brown (5YR 4/4) clay; strong, medium, angular blocky structure; thick, continuous clay films; very firm; plentiful roots; many small manganese concretions; numerous chert fragments from one-eighth inch to 10 inches in size; strongly acid; gradual, wavy boundary.

IIB23—32 to 36 inches, yellowish-red (5YR 4/6) cherty clay; moderate, medium, subangular blocky structure; slightly acid.

IIIR—36 to 60 inches, fissured dolomite bedrock with seams of clay in the fissures.

About one-third to two-thirds of the IIB2 horizon formed in residuum of dolomitic clay. The depth to bedrock ranges from 24 to 42 inches.

Dubuque soils formed in thinner loess than Palsgrove soils. They are lighter colored and have a thinner surface horizon than Ashdale soils.

Dunbarton Series

The Dunbarton series consists of well-drained soils underlain by dolomite bedrock at a depth of less than 20 inches. The lower part of the solum formed in dolomite residuum.

These soils are members of a clayey, montmorillonitic, mesic family of Lithic Hapludalfs.

Representative profile of Dunbarton silt loam in the NE¼SW¼ sec. 3, T. 14 N., R. 3 W.:

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine to medium, granular structure; friable; abundant roots; numerous chert fragments and stones; mildly alkaline; clear, smooth boundary.

A2—6 to 10 inches, brown (10YR 5/3) silt loam; weak, thin, platy structure; friable; abundant roots; numerous chert fragments; neutral; clear, smooth boundary.

IIB21t—10 to 12 inches, brown (10YR 4/3) light silty clay loam; moderate, fine to medium, subangular blocky structure; thin, patchy clay films; firm; plentiful roots; numerous chert fragments; slightly acid; clear, wavy boundary.

IIB22t—12 to 18 inches, dark reddish-brown (5YR 3/4) silty clay; fine to medium, angular blocky structure; dolomite stones and slabs containing much chert; thick, continuous clay films; very firm; plentiful to few roots; slightly acid; diffuse, irregular boundary.

IIIR—18 inches, fractured dolomite.

The solum ranges from 12 to 20 inches in thickness. The color of the surface soil is grayish brown or dark grayish brown. The texture of the residuum ranges from clay loam to silty clay.

Dunbarton soils are closely associated with Sogn soils.

Ettrick Series

The Ettrick series consists of deep, poorly drained silty soils that formed on high bottom land in deep silty alluvium brought down from the loess-covered uplands. They are flooded occasionally. The native vegetation consisted of grasses, sedges, reeds, and other water-tolerant plants.

Ettrick soils are members of a fine-silty, mixed, noncalcareous, mesic family of Typic Argiaquolls.

Representative profile of Ettrick silt loam in the NE¼SE¼ sec. 25, T. 14 N., R. 1 E., 300 feet south of Highway 33 and 50 feet west of section line:

Ap—0 to 8 inches, black (10YR 2/1) silt loam; weak, fine, granular structure; friable; many roots; some worm channels; neutral; clear, wavy boundary.

A12—8 to 12 inches, very dark gray (10YR 3/1) silty clay loam; few, fine, faint mottles of dark gray (10YR 4/1) and dark grayish brown (10YR 4/2); weak, fine, subangular blocky structure; firm; many roots; some worm channels; neutral; clear, wavy boundary.

A3—12 to 15 inches, dark-gray (10YR 4/1) silty clay loam; common, medium, faint mottles of brown (10YR 4/3); weak, fine, subangular blocky structure; sticky; many roots; some worm channels; neutral; clear, wavy boundary.

Btg—15 to 30 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, medium, distinct mottles of light olive brown (2.5Y 5/6); weak, fine, subangular blocky structure; thin, patchy clay films; sticky; many roots; neutral; clear, wavy boundary.

C1g—30 to 36 inches, light brownish-gray (2.5Y 6/2) silty clay loam; few, fine, distinct mottles of light olive brown (2.5Y 5/6) and olive brown (2.5Y 4/4); weak, medium, subangular blocky structure; sticky; few roots; neutral; gradual, wavy boundary.

C2g—36 to 60 inches, light brownish-gray (2.5Y 6/2) silt loam; many, distinct, yellowish-brown (10YR 5/8) mottles in planes or layers; common, dark reddish-brown (5YR 2/2) manganese concretions; massive; slightly sticky; mildly alkaline.

The surface horizon varies in thickness and in content of organic matter. In some areas several inches of lighter colored material has been deposited on the surface. In some there are thin lenses of coarse-textured material.

Ettrick soils have a darker, thicker A horizon than the somewhat poorly drained Boaz soils.

Fayette Series

The Fayette series consists of deep, well-drained silty soils that formed in deposits of loess more than 42 inches thick on ridges, rock benches, high stream terraces, and valley slopes. The original vegetation was deciduous forest.

These soils are members of a fine-silty, mixed, mesic family of Typic Hapludalfs.

Fayette soils on ridges and rock benches are gently sloping to steep. On high stream terraces, they are mostly nearly level to sloping but range to moderately steep at the boundary between terraces and flood plains. On valley slopes these soils are sloping to very steep. The solum is

generally thicker on stream terraces and thinner on valley slopes. In a few areas on stream terraces, mainly in the moderately steep soils, there are thin lenses of fine sand in the lower part of the solum. On some valley slopes below sandstone escarpments, the A horizon is fine sandy loam and the B21 horizon is heavy loam.

Representative profile of Fayette silt loam, SW¼SW¼ sec. 24, T. 13 N., R. 6 W.:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable; abundant roots; neutral; clear, smooth boundary.

A2—7 to 9 inches, grayish-brown (10YR 5/2) silt loam; moderate, thin, platy structure; friable; abundant roots; neutral; clear, smooth boundary.

B1—9 to 15 inches, dark yellowish-brown (10YR 3/4) to brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; friable; abundant roots; slightly vesicular; small amount of bleached silt on peds; neutral; clear, wavy boundary.

B21t—15 to 21 inches, brown (10YR 4/3) silty clay loam; moderate, fine, subangular blocky structure; thin, discontinuous clay films; firm; plentiful roots; vesicular; bleached silt on peds; slightly acid; clear, wavy boundary.

B22t—21 to 28 inches, brown (10YR 4/3) silty clay loam; strong, medium, subangular blocky structure; thick, continuous clay films; very firm; plentiful roots; bleached silt on peds; medium acid; clear, wavy boundary.

B23t—28 to 34 inches, brown (10YR 4/3) light silty clay loam; moderate, medium, subangular blocky structure; thin, patchy clay films; firm; plentiful roots; bleached silt on peds; medium acid; clear, wavy boundary.

B3—34 to 42 inches, brown (10YR 4/3) heavy silt loam; moderate, coarse, subangular blocky structure; friable to firm; few roots; bleached silt on peds; medium acid; gradual, wavy boundary.

C—42 to 60 inches, yellowish-brown (10YR 5/4) silt loam; massive; friable; few roots; slightly acid at a depth of 50 inches, and neutral at a depth of 60 inches.

The thickness of the loess ranges from 42 inches to 8 feet. The texture of the surface layer is silt loam or fine sandy loam.

Fayette, Lindstrom, and Tama soils all formed in deep loess, but Fayette soils have a thinner surface horizon. They formed in thicker loess than Palsgrove soils and have less clay in the lower B horizon. The associated Stronghurst soils also formed in loess but are somewhat poorly drained.

Gale Series

The Gale series consists of well-drained silty soils that are moderately deep over sand and weathered sandstone. These soils formed in loess over sandstone on valley slopes and ridges. The upper part of the solum formed in 20 to 36 inches of loess. The lower part of the B horizon is in sandstone residuum. The original vegetation was deciduous forest.

Gale soils are members of a fine-silty over sandy or sandy-skeletal, mixed, mesic family of Typic Hapludalfs.

Representative profile of a Gale silt loam, NW¼SW¼ SW¼ sec. 23, T. 14 N., R. 1 E.:

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine to medium, granular structure; friable; abundant roots; neutral; clear, wavy boundary.

A2—6 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure; friable; abundant roots; neutral; clear, wavy boundary.

B1—9 to 19 inches, brown (10YR 4/3) heavy silt loam; moderate, fine, subangular structure; friable; thin clay films; plentiful roots; vesicular; slightly acid; clear, wavy boundary.

B2t—19 to 29 inches, brown (10YR 4/3) light silty clay loam; moderate, fine to medium, subangular blocky structure; friable to firm; thin clay films; plentiful roots; vesicular; few 1-inch to 3-inch sandstone fragments; medium acid; gradual boundary.

IIB3t—29 to 35 inches, dark yellowish-brown (10YR 4/4) heavy sandy loam; weak, coarse, subangular blocky structure; friable; thin clay films; strongly acid; clear, smooth boundary.

IIC1—35 to 48 inches, brownish-yellow (10YR 6/6) fine sand; loose; few roots; several 3-inch to 6-inch bands of dark yellowish-brown (10YR 4/4) fine sand and very friable yellowish-brown (10YR 5/8) loamy fine sand; medium acid.

IIC2—48 inches, weathered sandstone.

The color of the A1 horizon is very dark grayish brown to grayish brown.

Gale soils differ from Fayette soils in having formed in less than 42 inches of silt. They are associated with Norden soils but do not have the glauconitic parent material and have a coarse-textured, lighter colored substratum. Gale soils formed in fine sand, loamy fine sand, and weathered sandstone, whereas Hixton soils formed entirely in sandstone residuum.

Hixton Series

The Hixton series consists of well-drained loamy soils that are moderately deep over sand. These soils formed in sandy material weathered from sandstone bedrock on valley slopes and upland ridges. The sand or sandstone bedrock is generally at a depth of 20 to 40 inches. The slopes are generally convex and range from sloping to very steep.

Hixton soils are members of a fine-loamy over sandy or sandy-skeletal mixed, mesic family of Typic Hapludalfs.

Representative profile of Hixton loam, SE¼NE¼ sec. 3, T. 11 N., R. 5 W.:

O—2 inches to 0, very dark brown (10YR 2/2) organic litter from hardwood trees; clear, wavy boundary.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine, granular structure; very friable; many roots; few small sandstone fragments; medium to slightly acid; clear, wavy boundary.

A2—6 to 7 inches, dark grayish-brown (10YR 4/2) light loam; very weak, thin, platy structure; very friable; plentiful roots; slightly vesicular; few small sandstone fragments; very strongly acid; clear, wavy boundary.

B1t—7 to 13 inches, brown (10YR 4/3) loam; weak, fine, subangular blocky structure; thin, patchy clay films; friable; plentiful roots; vesicular and have light-gray, bleached silt on peds; few small sandstone fragments; very strongly acid; clear, wavy boundary.

B2t—13 to 21 inches, brown (10YR 4/3) heavy loam; moderate, medium, subangular blocky structure; thick, continuous clay films; friable; plentiful roots; vesicular; some light-gray bleached silt on peds; few small sandstone fragments; very strongly acid; clear, wavy boundary.

B3—21 to 26 inches, yellowish-brown (10YR 5/6) sandy loam; weak, coarse, subangular blocky structure; very friable; few roots; few small sandstone fragments; strongly acid; clear, smooth boundary.

C—26 to 60 inches, brownish-yellow (10YR 6/8) fine sand; single grain; loose; few roots; many strong-brown (7.5YR 5/6) sandstone fragments; strongly acid.

The texture of the A1 horizon ranges from loam to fine sandy loam. Where the A1 horizon is fine sandy loam, the B2 horizon is generally loam; where the A1 is loam, the B2 is heavy loam. In some places there are thin layers of sandy loam in the C horizon.

Hixton soils are associated with Gale soils but have a coarser textured surface layer and subsoil. They have less fines in their solum than Norden soils and formed in nonglauconitic sandstone material. They are less sandy than Boone soils.

Houghton Series

The Houghton series consists of organic soils of the Histosol order. These are deep, black, very poorly drained soils

that formed in partly decomposed sedges, reeds, grasses, and other plant materials, generally in seepage or depressional areas of bottom lands. The degree of plant disintegration varies from place to place. The total acreage is small, and the areas are scattered throughout the county.

Representative profile of Houghton muck, SE¼NW¼ sec. 36, T. 13 N., R. 2 W.:

0 to 10 inches, black (5YR 2/1) muck; weak, thick, platy structure that breaks to weak, very fine, subangular blocky structure; friable; many fibrous roots; neutral; gradual, smooth boundary.
10 to 21 inches, black (10YR 2/1) muck; weak, fine, subangular blocky structure; very friable; many fibrous roots; neutral; gradual, smooth boundary.
21 to 42 inches, black (10YR 2/1) to very dark brown (10YR 2/2) mucky peat; weak, thick, platy structure that breaks to weak, fine, subangular blocky structure; friable; neutral; gradual, smooth boundary.
42 to 60 inches, black (10YR 2/1) muck; weak, thick, platy structure; friable; neutral.

The color of the uppermost horizon is black or very dark brown.

Huntsville Series

The Huntsville series consists of deep, well drained to moderately well drained silty soils that formed in deep, silty recent alluvium washed down from the loess-covered prairie uplands. These soils are on bottom lands and are flooded occasionally.

Huntsville soils are members of a fine-silty, mixed, mesic family of Cumulic Hapludolls.

Representative profile of Huntsville silt loam in the SW¼ sec. 31, T. 13 N., R. 1 W.:

Ap—0 to 9 inches, very dark brown (10YR 2/2) silt loam; weak, medium, granular structure; very friable; roots abundant; neutral; clear, smooth boundary.
A12—9 to 17 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; abundant roots; neutral; clear, wavy boundary.
C1—17 to 29 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; weak, fine and medium, subangular blocky structure; friable; plentiful roots; neutral; clear, wavy boundary.
C2—29 to 36 inches, dark-brown (10YR 3/3) heavy loam; weak, medium, subangular blocky structure; friable; plentiful roots; neutral; clear, wavy boundary.
C3—36 to 42 inches, dark-brown (10YR 3/3) gritty loam; few, fine, faint, yellowish-brown (10YR 5/6) mottles; massive; friable; few roots; neutral.

The color, thickness, and number of horizons vary, depending upon the nature of deposition. In undisturbed areas, the entire A horizon is black (10YR 2/1). In some places there are older depositions of dark grayish-brown heavy silt loam at a depth of 30 to 42 inches. The reaction is neutral to mildly alkaline.

Huntsville soils are in positions similar to those of Arenzville soils but are darker colored throughout the profile because the alluvial material was derived from prairie soils. They are more stratified than Worthen soils and have fewer stone fragments. They are in a drainage catena with the somewhat poorly drained Lawson soils.

Kickapoo Series

The Kickapoo series consists of deep, well drained and moderately well drained sandy soils. These soils have a moderately light, friable, loamy A horizon 20 to 40 inches thick over a buried, moderately dark colored, loamy A horizon. The solum is commonly 30 to 40 inches thick or more and is medium acid to nearly neutral in reaction.

Kickapoo soils are members of a coarse-loamy, mixed, nonacid, mesic family of Typic Udifluvents.

Representative profile of Kickapoo fine sandy loam in a pasture in the NE¼NW¼ sec. 30, T. 13 N., R. 2 W.:

A11—0 to 6 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, medium, granular structure; friable; neutral; abrupt, smooth boundary.
A12—6 to 14 inches, stratified dark grayish-brown and brown (10YR 4/2 and 5/3) fine sand and fine sandy loam; weak, medium, platy structure; very friable; many earthworm holes and casts; plentiful roots; neutral; clear, wavy boundary.
A13—14 to 36 inches, stratified dark-brown, dark grayish-brown, and yellowish-brown (10YR 4/3, 4/2, and 5/6) fine sandy loam, silt, and sand; weak, thick, platy structure; friable; few roots; few, fine, distinct mottles of grayish brown and yellowish brown (10YR 5/2 and 5/8) below a depth of 30 inches; neutral; abrupt, wavy boundary.
A14b—36 to 40 inches, stratified very dark gray and very dark grayish-brown (10YR 3/1 to 3/2) silt loam; weak, medium, subangular blocky structure; friable; many, fine, faint, distinct mottles of yellowish brown and dark brown (10YR 5/6 and 3/4); neutral; clear, wavy boundary.
A15—40 to 60 inches, stratified dark-gray, brown, and very dark gray (10YR 4/1, 5/3, and 3/1) silt, fine sand, fine sandy loam, and loam; weak, thick, platy structure; friable; many, medium, faint and distinct mottles of dark brown and strong brown (10YR 3/4 and 7.5YR 5/6); neutral.

The depth to the buried A horizon ranges from 20 to 40 inches but is generally between 24 and 36 inches. The color of the A11 horizon ranges from very dark grayish brown to brown (10YR 3/2 to 5/3). Stratification in the solum is extremely variable. The range is from rather uniform loamy material to alternating layers of silt, sand, and loam. The lower part of the solum is generally mottled, but the mottles range from a few fine ones to many, medium, distinct ones.

Lawson Series

The Lawson series consists of deep, somewhat poorly drained silty soils that formed in recent silty alluvium brought down from loess-mantled uplands and deposited on bottom lands by floods. These soils are on nearly level, broad flood plains of major streams and on narrow bottom lands of smaller streams.

Lawson soils are members of a fine-silty, mixed, mesic family of Cumulic Hapludolls.

Representative profile of Lawson silt loam, NW¼ sec. 34, T. 13 N., R. 2 W.:

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; friable; abundant roots; neutral; clear, wavy boundary.
A12—8 to 18 inches, very dark gray (10YR 3/1) silt loam; weak, thin, platy structure; friable; abundant roots; slightly vesicular; very slight amount of bleached dust on ped surfaces; neutral; gradual, wavy boundary.
A13g—18 to 24 inches, very dark gray (10YR 3/1) silt loam; a few, fine, faint, dark yellowish-brown (10YR 3/4) mottles; weak, thick, platy structure that readily breaks to weak, fine, subangular blocky; friable; plentiful roots; slightly vesicular; small amount of bleached dust on ped surfaces; neutral; gradual, wavy boundary.
A14g—24 to 48 inches, very dark gray (10YR 3/1) heavy loam; common, medium, faint, dark yellowish-brown (10YR 3/4) mottles; very weak, fine, subangular blocky structure; friable; plentiful roots; slightly vesicular; moderate amount of bleached dust on ped surfaces; neutral; gradual, wavy boundary.
A15g—48 to 54 inches, black (10YR 2/1) silt loam; a few, faint, dark yellowish-brown (10YR 3/4) mottles; massive; friable; few roots; neutral.

The reaction ranges from mildly alkaline to slightly acid. The A13 and A14 horizons are weakly stratified. The amount

of sand, fine gravel, or chert in these horizons ranges from 5 to 20 percent.

These soils are lower and more poorly drained than Huntsville soils. They are darker colored throughout their profile than Orion soils.

Lindstrom Series

The Lindstrom series consists of deep, well-drained, silty soils that formed in deep deposits of loess on concave valley slopes. The original vegetation consisted of prairie grass and a few scattered oaks. These soils are widely scattered throughout the county and are more commonly on south-facing slopes.

Lindstrom soils are members of a fine-silty, mixed, mesic family of Cumulic Hapludolls.

Representative profile of Lindstrom silt loam, SE¼ NW¼ sec. 7, T. 14 N., R. 5 W.:

Ap—0 to 8 inches, black (10YR 2/1) silt loam; weak, medium, granular structure; friable; abundant roots; neutral; clear, wavy boundary.

A12—8 to 16 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; friable; abundant roots; neutral; clear, wavy boundary.

A3—16 to 21 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, subangular blocky structure; friable; abundant roots; vesicular; slightly acid; clear, wavy boundary.

B1—21 to 30 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, fine, subangular blocky structure; friable; plentiful roots; vesicular; some mixing by earthworms; slightly acid; clear, wavy boundary.

B2—30 to 40 inches, dark yellowish-brown (10YR 3/4) to brown (10YR 4/3) heavy silt loam; moderate, medium, subangular blocky structure; firm; plentiful roots; vesicular; slightly acid; clear, wavy boundary.

B3—40 to 50 inches, brown (10YR 4/3) silt loam; moderate, coarse, subangular blocky structure; friable; few roots; vesicular; slightly acid; clear, wavy boundary.

C—50 to 60 inches, yellowish-brown (10YR 5/4) silt loam; massive; friable; few roots; slightly acid.

In some places sandstone and dolomite fragments occur throughout the solum, and the A horizon is sandier.

Lindstrom and Fayette soils formed in similar positions and in parent material, but Lindstrom soils have a thicker, darker A horizon. Lindstrom soils are similar to Tama soils, which are on upland ridges, but generally have slightly less structural development in the B horizon. They also have a somewhat coarser textured subsoil and substratum than Tama soils.

Medary Series

The Medary series consists of deep, moderately well drained silty soils that overlie lacustrine clay at a shallow depth. These soils formed in a thin mantle of loess over slack-water deposits of silt and clay on high stream terraces laid down in glacial times by the Mississippi River. They are mainly on the lower reaches of the Bad Axe River and Coon Creek valleys. The native vegetation consisted of deciduous trees.

Medary soils are members of a fine, mixed, mesic family of Typic Hapludalfs.

Representative profile of Medary silt loam in the NE¼ SW¼ sec. 30, T. 14 N., R. 6 W., 200 feet west of escarpment and 100 feet south of Highway 162:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, very thick, platy structure breaking readily to weak, fine, subangular blocky; very friable; many roots; slightly vesicular; slightly acid; abrupt, smooth boundary.

B1—7 to 14 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, fine, subangular blocky structure; firm; many roots; vesicular; medium acid; clear, smooth boundary.

IIB2t—14 to 24 inches, reddish-brown (2.5YR 4/4) silty clay; moderate, fine, subangular blocky structure; thick, continuous clay films; sticky; few roots; slightly vesicular; strongly acid; clear, smooth boundary.

IIB3t—24 to 30 inches, reddish-brown (5YR 4/3) silty clay; few, medium, distinct mottles of yellowish red (5YR 5/6); weak, fine, subangular blocky structure; thin, patchy clay films; plastic; few roots; slightly vesicular; strongly acid; clear, wavy boundary.

IIC—30 to 50 inches, reddish-brown (5YR 5/3) silty clay; common, coarse, distinct mottles of yellowish red (5YR 4/8) and strong brown (7.5YR 5/6); massive; many, small, dark-colored manganese concretions; strongly acid.

The thickness of the loess mantle ranges from 8 to 20 inches. In some places the B2 and B3 horizons are clay.

Medary soils are associated with Fayette and Rozetta soils on benches but have a subsoil of silty clay rather than of silty clay loam.

Muscatine Series

The Muscatine series consists of deep, somewhat poorly drained, silty soils that formed in wind-laid deposits of silt more than 42 inches thick over stratified silt and sand. These soils are nearly level and gently sloping and are on stream terraces. The original vegetation was prairie grass.

Muscatine soils are members of a fine-silty, mixed, mesic family of Aquic Argiudolls.

Representative profile of Muscatine silt loam, benches, in the SE¼NW¼ sec. 10, T. 14 N., R. 5 W., 150 feet north and 150 feet west of the center of the section:

Ap—0 to 8 inches, very dark brown (10YR 2/2) silt loam; weak, fine, granular structure; friable; many roots; neutral; abrupt, wavy boundary.

A12—8 to 12 inches, very dark brown (10YR 2/2) silt loam; weak, thick, platy structure breaking to weak, fine, subangular blocky; friable; many roots; slightly vesicular; slightly acid; clear, wavy boundary.

A3—12 to 15 inches, very dark gray (10YR 3/1) silt loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); moderate, thick, platy structure breaking to moderate, fine, subangular blocky; friable; many roots; slightly vesicular; medium acid; clear, wavy boundary.

B21tg—15 to 21 inches, dark-gray (10YR 4/1) silty clay loam; many, faint, dark grayish-brown (10YR 4/2) and distinct, yellowish-brown (10YR 5/6) mottles; moderate, fine, subangular blocky structure; thin, discontinuous clay films; slightly sticky; many roots; slightly vesicular; medium acid; clear, wavy boundary.

B22tg—21 to 28 inches, dark grayish-brown (10YR 4/2) silty clay loam; many distinct mottles of yellowish brown (10YR 5/6); moderate, fine, subangular blocky structure; thick, continuous clay films; slightly sticky; few roots; vesicular; medium acid; clear, wavy boundary.

B31g—28 to 42 inches, gray (10YR 5/1) silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); weak, fine, subangular blocky structure; slightly sticky; vesicular; slightly acid; clear, wavy boundary.

IIB32g—42 to 48 inches, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/8) light silty clay loam with thin lenses of sand; massive; plastic; many dark reddish-brown (5YR 2/2) manganese concretions; slightly acid.

IIC—48 to 60 inches, light brownish-gray (10YR 6/2) stratified silt and sand.

The depth to the B21g horizon ranges from 12 to 15 inches. The B21tg and B22tg horizons are light to heavy silty clay loam.

Muscatine soils are darker colored than Stronghurst soils and have a thicker A horizon.

NORDEN SERIES

The Norden series consists of moderately deep, well-drained silty and loamy soils that formed in silty and medium-textured material over fine-grained sandstone containing glauconite, siltstone, and shale. These soils are on valley slopes and bedrock benches in the eastern part of the county and to some extent in the western part.

Norden soils are members of a fine-loamy, mixed, mesic family of Typic Hapludalfs.

Representative profile of Norden silt loam in the NE¼ SW¼ sec. 5, T. 14 N., R. 5 W.:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; friable; slightly acid; clear, smooth boundary.

A2—7 to 10 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; slightly acid; clear, wavy boundary.

B1—10 to 17 inches, brown (10YR 5/3) heavy silt loam; moderate, fine, subangular blocky structure; friable; slightly acid; clear, wavy boundary.

B21t—17 to 30 inches, brown (10YR 4/3) light silty clay loam; moderate, medium, subangular blocky structure; thin, discontinuous clay films; firm; medium acid.

IIB22t—30 to 34 inches, brown (10YR 4/3) light silty clay loam; moderate, medium, subangular blocky structure; thick, continuous clay films; firm; medium acid; clear, wavy boundary.

IIB3—34 to 37 inches, olive-brown (2.5Y 4/4) sandy clay loam; moderate, coarse, subangular blocky structure; friable; medium acid; clear, wavy boundary.

IIC—37 to 40 inches, light olive-brown (2.5Y 5/6) sandy clay loam; massive; medium acid. This layer overlies sandstone.

IIIR—40 inches +, sandstone.

Norden soils are mostly silty throughout their profile, but some have a loam or fine sandy loam A horizon and a loam subsoil. The depth to sandstone ranges from 24 to 40 inches.

Norden soils are associated with Fayette soils in valleys and with Gale and Hixton soils. The Norden silt loams formed in a thinner mantle of silt than the Fayette soils. The sandstone underlying Norden soils differs from that underlying Gale and Hixton soils.

NORWALK SERIES

The Norwalk series consists of moderately deep, moderately well drained silty soils that formed in moderately deep loess over red clay residuum of dolomite bedrock. The native vegetation was deciduous forest. These soils are inextensive and occur as small areas. They are gently sloping on or near the crests of ridges and sloping to moderately steep elsewhere.

Norwalk soils are members of a fine-silty, mixed, mesic family of Typic Hapludalfs.

Representative profile of Norwalk silt loam in the NE¼SW¼NW¼ sec. 18, T. 14 N., R. 2 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, subangular blocky structure; friable; plentiful roots; mildly alkaline; abrupt, smooth boundary.

A2—8 to 11 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; few roots; mildly alkaline; clear, smooth boundary.

B1—11 to 14 inches, brown (10YR 4/3) silt loam; weak, fine, subangular blocky structure; friable; few roots; few, medium, faint, dark yellowish-brown (10YR 4/4) mottles; neutral; gradual, smooth boundary.

B21—14 to 20 inches, brown (10YR 4/3) heavy silt loam; moderate, medium, subangular blocky structure; firm; few roots; few, medium, prominent, yellowish-red (5YR 4/6) mottles; medium acid; clear, smooth boundary.

B22t—20 to 26 inches, yellowish-brown (10YR 5/4) silty clay loam; strong, medium, subangular blocky structure; firm; few roots; many, fine, prominent, yellowish-red (5YR 4/6) mottles; brown, thick clay films; strongly acid; clear, smooth boundary.

IIB3t—26 to 30 inches, strong-brown (7.5YR 5/6) silty clay; weak, coarse, subangular blocky structure; very firm; brown (7.5YR 5/2), thick clay films; few chert fragments; strongly acid; clear, smooth boundary.

IIC—30 to 40 inches, strong-brown (7.5YR 5/6) clay; massive; numerous cherty fragments; strongly acid; abrupt, irregular boundary.

IIIR—40 inches +, cherty dolomite.

The thickness of the loess ranges from 18 to 40 inches. In places shaly material occurs in the substrata.

Norwalk soils are not so well drained as the closely associated Dubuque soils.

ORION SERIES

The Orion series consists of deep, somewhat poorly drained silty soils that formed in recently deposited silty alluvium on the flood plains of narrow valleys. The alluvium, in places, overlies a darker colored soil. The frequency of flooding varies, and there is an intermittent high water table.

Orion soils are members of a coarse-silty, mixed, nonacid, mesic family of Aquic Udifluvents.

Representative profile of Orion silt loam, SE¼NW¼ sec. 16, T. 12 N., R. 3 W.:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; brown (10YR 5/3) lenses of silt; weak, very thin, platy structure; friable; abundant roots; neutral; clear, smooth boundary.

A12—8 to 16 inches, dark-gray (10YR 4/1) silt loam; weak, very thin, platy structure; common, medium, prominent, dark reddish-brown (5YR 3/4) mottles on plate faces around roots; friable; plentiful roots; neutral; gradual, smooth boundary.

A13—16 to 32 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure breaking to weak, very fine, subangular blocky structure; few, coarse, distinct, yellowish-brown (10YR 5/6) mottles; friable; neutral; gradual, smooth boundary.

A14—32 to 48 inches, dark grayish-brown (10YR 4/2) silt loam; very weak, very thin, platy structure; few, coarse, prominent, yellowish-red (5YR 4/6) mottles; friable; neutral; gradual, smooth boundary.

A15—48 to 55 inches, very dark gray (10YR 3/1) silt loam; very weak, very thin, platy structure; few, coarse, prominent, yellowish-red (5YR 4/6) mottles; friable; mildly alkaline.

Thin lenses of very fine sand occur throughout the profile. Mottling normally occurs at a depth of less than 18 inches. The horizons vary in thickness as a result of stratification and because of the nature of deposits.

Orion soils are not so well drained as Arenzville soils. They are lighter colored than Lawson soils.

ORION SERIES, WET VARIANT

The wet variant of the Orion series consists of deep, poorly drained silty soils that formed in recent alluvial deposits and, in places, are underlain by a buried soil. These soils are in flood-plain depressions along large streams. They have a high water table and are frequently flooded.

These wet Orion soils are members of a fine-silty, mixed, nonacid, mesic family of Typic Haplaquents.

Representative profile of Orion silt loam, wet, in the SE¼NE¼ sec. 5, T. 12 N., R. 3 W.:

A11—0 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; few, fine, distinct, yellowish-brown (10YR 5/8) and prominent, dark reddish-brown (5YR 3/4) mottles; nonsticky; abundant roots; neutral; gradual, wavy boundary.

A12—12 to 24 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; many, medium and coarse, distinct, yellowish-brown (10YR 5/8) and prominent, dark reddish-brown (5YR 3/4) mottles; nonsticky; plentiful roots; neutral; clear, smooth boundary.

A13—24 to 36 inches, dark-gray (10YR 4/1) silt loam; weak, fine, subangular blocky structure; common, medium, prominent, dark reddish-brown (5YR 3/4) mottles; nonsticky; few roots; neutral; gradual, wavy boundary.

A14—36 to 48 inches, dark-gray (10YR 4/1) loam; massive; common, medium, prominent, dark reddish-brown (5YR 3/4) and yellowish-red (5YR 4/6) mottles; nonsticky; few roots; neutral; gradual, wavy boundary.

A15g—48 to 60 inches, gray (5Y 5/1) silt loam; massive; few, fine, distinct, greenish-gray (5G 5/1) and few, medium, prominent, yellowish-red (5YR 5/8) mottles; nonsticky; no roots; water table at a depth of 48 inches; neutral.

The thickness and arrangement of layers are dependent upon the deposition. Thin lenses of very fine sands occur in the profile in places.

These wet Orion soils are shallower to the water table and more mottled than the associated Orion silt loams. They are also flooded for longer periods. They are lighter colored than Ettrick soils, are less clayey throughout, and do not have a B horizon.

Palsgrove Series

The Palsgrove series consists of moderately deep, well-drained soils that formed under deciduous forest and are underlain by dolomite. The upper part of the solum formed is loess and the lower part in reddish-brown clay residuum of dolomite underlain by fissured dolomite.

Palsgrove soils are members of a fine-silty, mixed, mesic family of Typic Hapludalfs.

Representative profile of Palsgrove silt loam, NW¼ SE¼ sec. 14, T. 13 N., R. 2 W.:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, subangular blocky structure; friable; abundant roots; neutral; clear, wavy boundary.

A2—6 to 7 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; abundant roots; slightly acid; clear, wavy boundary.

B1—7 to 15 inches, brown (10YR 4/3) heavy silt loam; weak, fine, subangular blocky structure; friable; plentiful roots; small amount of bleached silt on peds; medium acid; clear, wavy boundary.

B21t—15 to 35 inches, dark yellowish-brown (10YR 3/4) silty clay loam; moderate, medium, subangular blocky structure; thin, patchy clay films; firm; plentiful roots; moderate amount of bleached silt on peds; medium acid; clear, wavy boundary.

IIB22t—35 to 42 inches, reddish-brown (5YR 4/4) clay; moderate, coarse, angular blocky structure; thick, continuous clay films; very firm; few roots; moderate amount of bleached silt on peds; numerous chert fragments; medium acid; clear, irregular boundary.

IIIR—42 inches +, fissured dolomite bedrock.

The thickness of loess ranges from 20 to 40 inches. The A2 horizon is absent in some cultivated areas. The depth to bedrock ranges from 42 to 92 inches.

Palsgrove soils are similar to and occur in close association with Dubuque and Fayette soils. They formed in deeper loess than Dubuque soils and have a smaller proportion of their solum in residuum. The solum of Fayette soils is entirely in loess. Palsgrove soils have a thinner, lighter colored A horizon than Ashdale soils, and they have an A2 horizon, which Ashdale soils lack.

Rockbridge Series

The Rockbridge series consists of well-drained silty soils that are moderately deep over coarse alluvium on stream terraces. These soils formed in silt 12 to 36 inches thick over local alluvium consisting of sand, chert pebbles, and cobblestones. Most areas are near or on terrace breaks. In places the alluvium is underlain by sandstone bedrock. These soils are inextensive and are mostly in the eastern part of the county.

Rockbridge soils are members of a fine-silty over fragmental, mixed, mesic family of Typic Hapludalfs.

Representative profile of Rockbridge silt loam in the center of the SW¼ sec. 2, T. 14 N., R. 1 E.:

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, granular structure; friable; many roots; neutral; clear, wavy boundary.

A2—6 to 8 inches, grayish-brown (10YR 5/2) silt loam; moderate, thin, platy structure; friable; many roots; vesicular; small amount of grayish silica dust on peds; neutral; clear, wavy boundary.

B1—8 to 13 inches, brown (10YR 4/3) light silty clay loam; weak, fine, subangular blocky structure; friable; plentiful roots; vesicular; grayish dust on peds; some wormholes and casts; medium acid; clear, wavy boundary.

B21t—13 to 20 inches, brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; thin, discontinuous clay films; firm; plentiful roots; vesicular; grayish dust on peds; few subrounded chert pebbles; medium acid; clear, wavy boundary.

IIB22t—20 to 25 inches, dark-brown (7.5YR 4/4) gravelly silty clay loam; strong, medium, subangular blocky structure; firm; plentiful roots; vesicular; grayish dust on peds; many clay films; about 50 percent subrounded chert pebbles and cobblestones up to 6 inches in diameter; strongly acid; gradual, wavy boundary.

IIB3t—25 to 35 inches, dark-brown (7.5YR 4/4) gravelly silty clay loam; moderate, medium, subangular blocky structure; firm; few roots; many clay films; more than 50 percent subrounded chert pebbles and cobblestones up to 10 inches in diameter; very strongly acid.

IIC—35 to 90 inches, dark-brown (7.5YR 4/4) gravelly loam; massive; few roots; subrounded chert pebbles and cobblestones up to 10 inches in diameter but mainly 2 inches in diameter; more sandy and gravelly in the lower part; very strongly acid.

The thickness of the A1 horizon ranges from 4 to 8 inches.

Rozetta Series

The Rozetta series consists of deep, moderately well drained silty soils on stream terraces in valleys. These soils formed in more than 42 inches of silt over stratified silty and sandy alluvium. The native vegetation was deciduous forest.

Rozetta soils are members of a fine-silty, mixed, mesic family of Typic Hapludalfs.

Representative profile of Rozetta silt loam in the SW¼NE¼ sec. 25, T. 14 N., R. 7 W.:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; weak, very fine to fine, subangular blocky structure; friable; many roots; slightly acid; clear, wavy boundary.

A2—11 to 13 inches, brown (10YR 5/3) silt loam; weak, thin, platy structure; friable; many roots; slightly vesicular; small amount of bleached silt dust on peds; slightly acid; clear, wavy boundary.

B1—13 to 21 inches, brown (10YR 4/3) heavy silt loam; weak, fine, subangular blocky structure; friable; plentiful roots; slightly vesicular; small amount of bleached silt dust on peds; slightly acid; clear, wavy boundary.

B2t—21 to 30 inches, brown (10YR 4/3) light silty clay loam; strong, medium, subangular blocky structure; thick, continuous clay films; firm; plentiful roots; slightly vesicular; moderate amount of bleached silt dust on peds; medium acid; clear, wavy boundary.

B31t—30 to 41 inches, brown (10YR 4/3) light silty clay loam; common, fine to medium, distinct, yellowish-brown

(10YR 5/8) and prominent, yellowish-red (5YR 4/8) mottles; moderate, coarse, subangular blocky structure; thin, discontinuous clay films; firm; few roots; slightly vesicular; much bleached silt dust on peds; strongly acid; clear, wavy boundary.

B32—41 to 60 inches, yellowish-brown (10YR 5/4) silt loam; many, coarse, distinct, strong-brown (7.5YR 5/8) and faint, light brownish-gray (10YR 6/2) mottles; massive; friable; few roots; strongly acid to slightly acid.

In some areas there are thin seams of fine sand at a depth of 36 inches or more.

Rozetta soils are associated with well-drained Fayette soils and somewhat poorly drained Stronghurst soils. All of these soils have similar parent material.

Sogn Series

The Sogn series consists of well-drained, stony soils that are shallow over dolomite. These soils formed in a thin mantle of loess over weathered and fissured dolomite bedrock. Most areas have convex slopes and are near the upper breaks of escarpments and on narrow, knifelike ridges. The original vegetation consisted of prairie grass and hardwood trees.

Sogn soils are members of a loamy, mixed, mesic family of Lithic Hapludolls.

Representative profile of Sogn stony silt loam in the SE¼SW¼ sec. 24, T. 13 N., R. 5 W.:

Ap—0 to 7 inches, very dark gray (10YR 3/1) silt loam; moderate, fine, granular structure; friable; abundant roots; many chert and limestone fragments and stones; mildly alkaline; gradual, wavy boundary.

A12—7 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; moderate, medium, granular structure; friable; abundant roots; many chert and limestone fragments and stones; mildly alkaline; clear, wavy boundary.

IIR—12 inches +, fissured dolomite; some chert fragments; brown (10YR 5/3) gritty loam in the fissures; strongly effervescent.

Sogn soils formed in a thinner mantle of loess than Dubuque and Dodgeville soils and lack the textural B horizon and the red clay residuum of those soils.

Sparta Series

The Sparta series consists of excessively drained sandy soils that are deep over sand. These soils formed in sandy outwash on stream terraces under prairie grass.

Sparta soils are members of a sandy, mixed, mesic family of Entic Hapludolls.

Representative profile of Sparta loamy sand in the NW¼SW¼ sec. 4, T. 14 N., R. 7 W., at the south end of Goose Island:

Ap—0 to 6 inches, very dark brown (10YR 2/2) loamy sand; weak, medium, crumb structure; very friable; many roots; strongly acid; clear, wavy boundary.

A12—6 to 12 inches, very dark brown (10YR 2/2) loamy sand with weak, medium, crumb structure; very friable; plentiful roots; medium acid; clear, wavy boundary.

AC—12 to 17 inches, dark-brown (7.5YR 3/2) loamy sand; weak, fine, crumb structure; very friable; plentiful roots; medium acid; clear, wavy boundary.

C1—17 to 22 inches, brown (10YR 4/3) medium sand; weak, fine, crumb structure; loose; few roots; medium acid; clear, wavy boundary.

C2—22 to 56 inches, yellowish-brown (10YR 5/4) fine sand; single grain; loose; few roots to a depth of 30 inches; about 25 percent granitic sand and about 75 percent quartz sand; slightly acid.

The color of the Ap and A1 horizons is very dark brown or very dark grayish brown.

Sparta soils formed in coarser outwash material than Dakota soils and lack the B horizon development that is typical of those soils.

Stronghurst Series

The Stronghurst series consists of somewhat poorly drained silty soils that are deep over silt loam. These soils formed mostly in loess on gently sloping uplands near the crests of ridges. In some areas they formed in old alluvium. The depth of the loess is more than 42 inches. The native vegetation was hardwood forest. These soils are inextensive and occur mainly in the Westby-Newry area.

Stronghurst soils are members of a fine-silty, mixed, mesic family of Aeric Ochraqualfs.

Representative profile of Stronghurst silt loam in the NE¼NW¼ sec. 14, T. 14 N., R. 4 W.:

Ap—0 to 7 inches, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable; neutral; clear, smooth boundary.

A2—7 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, thin, platy structure; friable; neutral; clear, smooth boundary.

B1—8 to 13 inches, brown (10YR 4/3) heavy silt loam; moderate, fine, subangular blocky structure; firm; evidence of some earthworm activity; medium acid; clear, wavy boundary.

B21tg—13 to 20 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, medium, subangular blocky structure; thick, continuous clay films; firm; few, fine, prominent, reddish-brown (5YR 4/4) and grayish-brown (10YR 5/2) mottles; small amount of bleached silt on peds; strongly acid; clear, wavy boundary.

B22tg—20 to 40 inches, grayish-brown (10YR 5/2) heavy silt loam; moderate, coarse, subangular blocky structure; thick continuous clay films; firm; many, coarse, prominent, reddish-brown (5YR 4/4) mottles; much bleached silt on peds; few, small, dark, manganese concretions at a depth of 30 inches; concretions are larger and more numerous in the lower part; strongly acid; gradual, wavy boundary.

Cg—40 to 48 inches, grayish-brown (10YR 5/2) silt loam; massive friable; many, coarse, prominent, reddish-brown (5YR 4/4) and strong-brown (7.5YR 5/6) mottles; numerous, dark-colored, manganese concretions; strongly acid.

The color of the Ap horizon is dark gray, very dark gray, or very dark grayish brown. The A2 horizon is dark grayish brown or grayish brown and is 1 to 3 inches thick. The solum on old high terraces is generally thicker, slightly darker, and slightly more clayey than elsewhere. In a few small areas there are thin lenses of fine sand in the lower part of the profile.

Stronghurst soils are associated with Fayette soils and formed in similar parent material, but they generally have a grayer B horizon that is mottled.

Tama Series

The Tama series consists of well-drained silty soils that are deep over sand. These soils formed in 42 inches or more of loess under prairie grass on wide ridges and high stream terraces in the west-central part of the county.

Tama soils are members of a fine-silty, mixed, mesic family of Typic Argiudolls.

Representative profile of Tama silt loam in the SW¼SW¼SW¼ sec. 21, T. 13 N., R. 4 W.:

A1—0 to 11 inches, black (10YR 2/1) silt loam; moderate, medium, granular structure; friable; abundant roots; mildly alkaline; gradual, wavy boundary.

A3—11 to 16 inches, very dark brown (10YR 2/2) silt loam; moderate, medium, granular structure; friable; roots abundant; slightly acid; gradual, wavy boundary.

B21t—16 to 24 inches, dark-brown (10YR 4/3) heavy silt loam; moderate, medium, subangular blocky structure; friable; plentiful roots; few thin clay films; wormholes and dark-colored worm casts; strongly acid; clear, wavy boundary.

B22t—24 to 37 inches, dark-brown (10YR 4/3) light silty clay loam; moderate, medium, subangular blocky structure; friable; plentiful roots; few thin clay films on ped faces; few wormholes and dark-colored worm casts; strongly acid; clear, wavy boundary.

B3—37 to 45 inches, dark yellowish-brown (10YR 4/4) to brown (10YR 4/3) heavy silt loam; moderate, medium, subangular blocky structure; friable; fewer roots than in B22t horizon; medium acid; clear, wavy boundary.

C—45 to 60 inches, brown (10YR 4/3) silt loam; massive; friable; few roots; medium acid.

On stream terraces the solum is generally thicker than is typical.

Tama soils are similar to Fayette and Downs soils but have a thicker, darker colored surface horizon than those soils and a weaker B horizon than Fayette soils.

Tell Series

The Tell series consists of well-drained silty soils that are moderately deep over sandy outwash. These soils formed in silt 24 to 42 inches thick over sandy outwash material on stream terraces. The natural vegetation consisted of hardwoods.

Tell soils are members of a fine-silty over sandy or sandy-skeletal, mixed, mesic family of Typic Hapludalfs.

Representative profile of Tell silt loam in the SE¼NE¼ sec. 17, T. 13 N., R. 2 W.:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2 moist) or grayish-brown (10YR 5/2 dry) silt loam; moderate, medium, granular structure; friable; abundant roots; neutral; clear, wavy boundary.

A2—9 to 12 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; abundant roots; vesicular; some bleached silt on peds; neutral; clear, wavy boundary.

B1—12 to 20 inches, brown (10YR 4/3) light silty clay loam; moderate, medium, subangular blocky structure; firm; many roots; vesicular; some bleached silt on peds; slightly acid; clear, wavy boundary.

B2t—20 to 30 inches, brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; thick, continuous clay films; firm; many roots; vesicular; some bleached silt on peds; medium acid; clear, wavy boundary.

IIB3t—30 to 35 inches, dark-brown (7.5YR 4/4) sandy clay loam; moderate, coarse, subangular blocky structure; thin, continuous clay films; friable; plentiful roots; many ¼- to 3-inch subrounded chert pebbles and a few sandstone pebbles; strongly acid; clear, smooth boundary.

IIC—35 to 48 inches, strong-brown (7.5YR 5/8) medium sand; loose; few roots; contains bands of dark reddish-brown (5YR 3/4) sandy loam that are strongly acid; many chert pebbles and some sandstone pebbles to a depth of 45 inches; medium acid at a depth of 48 inches.

The IIB3 horizon formed in the sandy outwash.

Worthen Series

The Worthen series consists of dark-colored, well drained to moderately well drained silty soils that are deep over silt loam. These soils formed in dark silty alluvium that was moved down by runoff water or by soil creep from prairie uplands. The alluvium was derived from loess. These soils are in small areas along intermittent drainageways at the bottom of foot slopes and in fan-shaped deposits at the mouth of drainageways throughout the county. The hazard of flooding ranges from slight to severe.

Worthen soils are members of a fine-silty, mixed, mesic family of Cumulic Hapludolls.

Representative profile of Worthen silt loam in the NE¼SW¼ sec. 10, T. 11 N., R. 5 W.:

A11—0 to 14 inches, black (10YR 2/1) silt loam; weak, fine, subangular blocky structure; friable; many roots; neutral; clear, wavy boundary.

A12—14 to 30 inches, very dark gray (10YR 3/1) silt loam; massive; friable; neutral; clear, wavy boundary.

A13—30 to 60 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, subangular blocky structure; friable; slightly acid to medium acid.

Included within the range of characteristics for the Worthen series are a very dark gray (10YR 3/1) color in the surface layer, a loam texture in the surface layer, mottling at a depth of 2 feet or more, thin lenses of lighter colored silt and fine sand throughout the profile, a weak B horizon, and chertiness.

Worthen soils occupy physiographic positions similar to those of Chaseburg soils but are darker colored. They lack the textural B horizon typical of Lindstrom soils, and they have less stratification than Huntsville soils.

General Nature of the County

French explorers and missionaries were the first white men to reach the area now known as Vernon County. Permanent white settlement began in the 1830's. The first land claim was established in the town of Franklin in the spring of 1844. The county was established in 1851, at which time it was named Bad Axe County. In 1862 the name was changed to Vernon County.

At the time of settlement, the area consisted of timberland, oak openings, and prairie. Most of the first settlers were farmers who raised wheat, corn, oats, and potatoes. Later, lumbering became important. During the last half of the nineteenth century, wheat was the major crop. At present, dairying is the main enterprise.

Most of the manufacturing enterprises are associated with agriculture. Cheesemaking is one of the largest. The packaging and distribution of butter and whole milk are also important. Several companies process leaf tobacco and maintain warehouses. Other industries include a cattle-breeding cooperative, a fertilizer factory, a power cooperative, mink ranches, and sawmills.

The population remained fairly stable from 1900 to 1940, but since that time it has gradually decreased. In 1960, the total population was 25,663. About 900 residents worked in industry, many outside the county.

Most town roads are gravel surfaced, most county and State roads are blacktopped, and the Federal highways are paved. Because of the dissected terrain, the roads turn and twist and grades are fairly steep.

Drainage

The four main streams in the drainage pattern of Vernon County are the Kickapoo River, the Bad Axe River, Coon Creek, and the Baraboo River. Some smaller drainageways flow directly into the Mississippi River, and some into Mill Creek, which is in Richland County.

The Kickapoo River, which drains parts of three counties, is the largest stream that originates in the Driftless

Area, and its watershed is the largest in Vernon County. It rises in Monroe County, to the north, and discharges into the Wisconsin River at Wauzeka in Crawford County, to the south. North of Readstown, the Kickapoo branches. The West Fork drains the areas around Avalanche and Bloomingdale, and the East Fork the areas around Viola, LaFarge, and Ontario. Ordinarily, the Kickapoo is a gentle, steady-flowing stream, but in times of heavy runoff it floods and damages buildings, crops, roads, and bridges.

The Bad Axe River, which flows into the Mississippi, drains much of the western part of the county. Its watershed is entirely within Vernon County. The Bad Axe River also floods periodically.

Coon Creek, which originates in La Crosse County and Monroe County and discharges into the Mississippi, drains the northwestern part of the county. The Coon Creek Watershed was the first erosion control demonstration project in the nation.

The Baraboo River drains a relatively small part of the county, in the eastern part near Hillsboro. It floods occasionally, but the floods are less damaging than those on the larger watersheds.

Physiography

The landscape of Vernon County is deeply and thoroughly dissected. It is characterized by comparatively narrow, steep-sided valleys and generally rolling ridges that range from a quarter of a mile to a mile in width. The elevation ranges from a low of 635 feet, near De Soto, to a high of 1,350 feet, on a broad ridge north of Westby. Differences in elevation between stream bottoms and ridgetops range from 200 to 550 feet.

In the western part of the county, gently rolling east-west ridges extend from a broad main ridge, and narrow, more strongly rolling north-south ridges branch off from these. Differences in elevation between stream bottoms and ridgetops in this part of the county range from 300 to 550 feet.

East of this steep, rough area is a broad, undulating ridge that is 2 to 6 miles wide and extends north and south the entire length of the county. Most of this ridge was originally prairie, and small areas of prairie extend in all directions from it.

The eastern part of the county resembles the western, but the ridges are narrower and the stream valleys wider and less steeply sloping. The landscape has a clearer pattern of bottom lands, dissected benches and slopes, and ridges. Differences in elevation range from 200 to 400 feet.

The bottom lands in this county, except those of the Mississippi, are narrow, those of the larger streams being only about three-quarters of a mile wide.

Climate [5]

No one station can provide more than an approximation of the climate of Vernon County, because of the many hills and valleys. The data in tables 8 and 9, compiled from records of the U.S. Weather Bureau at Viroqua, are more nearly representative of weather conditions on the hilltops than of those in the valleys. The valleys have wider daily and annual ranges in temperature and lower minimum temperatures than the higher elevations. They also receive smaller amounts of precipitation.

The climate is continental. Winters are long, cold, and snowy. Summers are warm. Brief periods in summer are hot and humid. Variations in temperature are about twice as great in winter as in summer. Spring and fall are seasons of frequent weather changes. The weather is the most unstable early in spring.

Temperatures vary considerably, not only from season to season but also from year to year. During the past several years, the number of days a year when the temperature fell to zero or lower ranged from 2 in 1931 to 45 in 1945. The number of days when the temperature rose to 90° F. or higher totaled 41 in 1934. No 90° F. temperature was recorded in 1951.

The probabilities of the last freezing temperatures in spring and the first in fall are shown in table 9. The average length of the growing season, that is, the number of days between the last date in spring when the temperature is 32° F. or lower and the first date in fall when it is 32° or lower, is 152 days. The growing season is approximately 2 weeks shorter in the valleys than on the hilltops; the dates of the specified temperatures are about a week later in spring and about a week earlier in fall than those shown in table 9. In the valleys the average date of the last temperature of 32° or lower in spring is May 6, and the average date of the first temperature of 32° or lower in fall is October 5.

During the growing season, the average number of growing-degree-day units above a threshold temperature of 40° is 4,000. Above a threshold temperature of 45°, it is 3,200, and above a threshold temperature of 50°, it is 2,500.

Annual precipitation is ample for all crops grown in the county. More than 60 percent of the annual total falls during the period May through September. The chance is 4 in 10 that 1 inch or more rain will fall in a 7-day period during the last 3 weeks of May, the second week of June, the last part of June or the first part of July, the fourth week of July, and the second and third weeks in September. About once in 2 years, intensive rainfall occurs at the rate of 1.15 inches in 30 minutes, 1.45 inches in 1 hour, 1.80 inches in 3 hours, 2.20 inches in 6 hours, 2.60 inches in 12 hours, and 2.95 inches in 24 hours. In summer most of the rain falls during thunderstorms.

The driest part of the growing season extends from the middle of August through the first week in September. The chance is 2 in 10 that during this period there will be a 7-day period during which only a trace or less of moisture will fall. The number of days in a year when 0.01 inch or more of precipitation falls averages 113. It has ranged from 101 to 125 days in 2 years out of 3.

The total annual snowfall has ranged from less than 25 inches to more than 75 inches. The average date of the first snowfall of 1 inch or more is November 14. The chance is 1 in 10 that 1 inch of snow will fall by October 22, and 9 in 10 that 1 inch will fall by December 7. A depth of 1 inch or more can be expected 20 percent of the time in November, 55 percent in December, 85 percent in January and February, 50 percent in March, and 5 percent in April. A depth of 10 inches or more can be expected 8 percent of the time in December and March, and more than 20 percent of the time in January and February.

[5] Prepared by MARVIN W. BURLEY, formerly State climatologist for Wisconsin, Weather Bureau, U.S. Department of Commerce.

TABLE 8.—*Temperature and precipitation data for Vernon County, Wis.*

[Based on records, 1930–59, kept at Viroqua, Wis. Elevation 1,275 feet]

Month	Temperature				Average heating degree days [1]	Precipitation			
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—			Average total	One year in 10 will have—		Average snowfall or sleet
			Maximum temperature equal to or higher than	Minimum temperature equal to or lower than—			Less than—	More than—	
	° F.	° F.	° F.	° F.	No.	In.	In.	In.	In.
January	25.5	7.3	42	−16	1,510	1.14	0.43	2.32	10.2
February	29.3	10.3	47	−10	1,270	1.05	.15	1.99	9.0
March	39.6	21.0	60	2	1,080	1.93	.88	3.45	11.6
April	56.2	34.9	76	23	580	2.51	.79	4.70	1.7
May	69.0	46.5	84	34	270	3.77	1.85	6.38	.6
June	79.1	56.8	92	45	80	4.80	2.18	7.66	0
July	84.8	61.4	97	51	10	4.02	1.05	8.09	0
August	82.7	59.3	94	48	30	3.59	.77	6.04	0
September	73.2	50.3	90	36	160	3.76	1.07	7.14	(2)
October	61.3	39.8	77	26	460	2.08	.41	4.79	.2
November	42.4	25.1	62	7	940	1.97	.60	3.24	5.8
December	29.0	13.6	44	−9	1,360	1.09	.31	1.99	7.6
Year	56.0	35.5			7,750	31.71			46.7

[1] Base 65° F. [2] Trace.

TABLE 9.—*Probabilities of last freezing temperatures in spring and first in fall at Viroqua, Wis., for 5 selected temperatures*

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
2 years in 10 later than	April 2	April 12	April 21	May 5	May 16
4 years in 10 later than	March 26	April 4	April 13	April 27	May 9
6 years in 10 later than	March 19	March 28	April 7	April 21	May 3
8 years in 10 later than	March 12	March 20	March 31	April 14	April 26
Fall:					
2 years in 10 earlier than	November 5	October 29	October 19	October 8	September 25
4 years in 10 earlier than	November 13	November 6	October 27	October 16	October 2
6 years in 10 earlier than	November 20	November 12	November 2	October 22	October 9
8 years in 10 earlier than	November 27	November 20	November 10	October 30	October 16

Thunderstorms occur on an average of 43 days a year. In some years they have occurred on as few as 23 days, and in other years on as many as 60 days. The violent storms are accompanied by strong winds and hail. Hail falls on an average of 3 days a year, generally between 3:00 and 10:00 p.m. In some years none has fallen. In other years hail has fallen on as many as 7 days. Damage from hailstorms has been largely to corn and tobacco crops. Since 1916, four tornadoes have passed through the county.

Heavy fog occasionally forms in winter when warm, moist air from the south passes over frozen or snow-covered ground. Often the fog persists for several days.

Records of windspeed, sunshine, and relative humidity are not available for Vernon County, but the following data taken from records kept at La Crosse approximate conditions in this county.

Prevailing winds are from the northwest in winter and from the south the rest of the year. The strongest winds blow in April, when the average windspeed is 12 miles per hour. August, the least windy month, has an average windspeed of 7 miles per hour. Windspeed is less than 4 miles per hour 10 percent of the time, 4 to 12 miles per hour 65 percent of the time, 13 to 31 miles per hour 25 percent of the time, and more than 31 miles per hour less than 1 percent of the time. Windspeed of more than 40 miles per hour can be expected every year, more than 60 miles per hour once in 3 years, and more than 90 miles per hour, at the

30-foot anemometer level, once in 50 years. The strongest winds generally blow from a westerly direction.

About 40 percent of the possible amount of sunshine is received in November and December, 60 percent and more from April through September, and 50 to 60 percent the rest of the time.

The approximate range in relative humidity in each season of the year is given in table 10.

TABLE 10.—*Approximate range in relative humidity*

Relative humidity	Percent of time in—			
	Winter	Spring	Summer	Fall
Less than 50 percent	5	20	15	15
50 to 79 percent	60	50	45	55
More than 79 percent	35	30	40	30

Water Supply

Vernon County has a plentiful supply of underground water (7). The principal waterbearing strata are the Dresbach, Franconia, and Trempealeau sandstone formations of the Cambrian system. Although the Franconia formation has considerable water-holding capacity, it does not allow water to flow freely in springs and wells. The Trempealeau formation above it, and the Dresbach formation below it, both allow such flow. Most wells in the uplands extend down into these formations and are approximately 100 to 400 feet deep. In the valleys, water can be obtained from shallower wells in the sandy, silty, and gravelly alluvium, or from somewhat deeper wells that extend into the Dresbach formation, which is under the alluvium.

Flowing springs are common along most of the lower valley slopes and bottom lands of the county. They are the sources of, or contributors to, many small streams. Most springs flow continuously, but a few dry up during extended dry periods.

Both well water and spring water are hard; the calcium carbonate content is between 200 and 300 parts per million. The mineral content is moderate.

There has been little need for irrigation, because rainfall is usually adequate and well distributed. Any irrigation in the future should be preceded by careful investigation, as the cost may be prohibitive in most areas.

Agriculture

Nearly 90 percent of the land in Vernon County is in farms. Dairy products—whole milk, butter, and cheese—are the major sources of farm income.

The 462,977 acres in farms at the time of the 1964 Census of Agriculture represents a continuation of a decline in farm acreage that began about 1950. Nearly half of the farm acreage in 1964, or 226,480 acres, was cropland, and a third, or 154,183 acres, was woodland. Only 61,946 acres was used exclusively as pasture, but about two-thirds of the woodland, or 107,898 acres, was grazed, and 37,872 acres classified as cropland was being used as pasture. The total pastured land therefore was 207,716 acres.

The trend is toward fewer but larger farms. The number of farms in 1964 was 2,968, and the average size was 156 acres. By far most of the farms, a total of 2,099, were operated by their owners; 522 were operated by part owners, 340 by tenants, and only 7 by managers. Livestock-share farming was the most common system of tenancy. Tenancy in general is on the decrease.

The number of cattle has increased slightly in recent years, and the number of hogs has remained stable. Chickens and sheep have been declining in numbers.

The numbers of livestock on farms in the county in 1964 were as follows:

	Number
Cattle	102,920
Milk cows	51,606
Hogs	20,720
Sheep	4,375
Chickens	112,428

Forage crops are grown extensively to provide feed for livestock. The climate is favorable for grain crops, but the terrain is such that much of the acreage is better suited to hay and pasture. The most common cropping system consists of a year of corn, a year of oats, and 2 or 3 years of hay. The acreage of the principal crops in 1964 was as follows:

	Acres
Corn	40,763
Oats	26,772
Alfalfa hay	85,075
Clover-timothy hay	9,059

Practically all the corn is fed to livestock on the farm where it is grown. Most is harvested for grain. Some silage corn is grown.

The acreage of oats has been decreasing, but oats is still the principal small grain crop. Barley, rye, and wheat are grown on a few hundred acres.

The total acreage in hay has remained fairly stable during the last 20 years, but since 1950 alfalfa has superseded clover-timothy mixtures as the main hay crop.

The common plants in permanent pastures are Kentucky bluegrass, white clover, redtop, and timothy. The extensive acreage of woodland used as pasture does not produce much forage.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. The amount of moisture held in a soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen; expressed as a percentage of the cation-exchange capacity.

Bottom land. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artificially.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour or are parallel to terraces or diversions. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Crop residue. The portion of a plant, or crop, left in the field after harvest.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Dug ponds. As used in this survey, ponds excavated in a low-lying area and depending on the ground water table or a drainage tile for recharge. Very little surface water is allowed to enter the ponds.

Eolian soil material. Soil parent material accumulated through wind action; commonly refers to sandy material in dunes.

Furrowing (forestry). Removing sod, debris, and other competition from a tree planting area by plowing furrows. Trees are planted in furrows.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

O horizon. The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon. The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and it is therefore marked by the accumulation of humus. The horizon may have lost one or more of the following: soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon. The mineral horizon below the A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. The combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon. The weathered rock material immediately beneath the solum. This layer, commonly called the soil parent material, is presumed to be like that from which the overlying horizons were formed in most soils. If the underlying material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R horizon. Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

Loess. A fine-grained eolian deposit consisting dominantly of silt-sized particles.

Mechanical analysis (soils). The process of determining the percentage of the various sizes of individual mineral particles, or separates, in the soil. It provides the data needed for textural classification.

Micro-organisms. Forms of life that are either too small to be seen with the unaided eye or are barely discernible.

Microrelief. Minor surface configurations of the land.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color, and other physical, mineralogical, and biological properties of the various horizons of the soil profile.

Muck. An organic soil consisting of fairly well decomposed organic material that is relatively high in mineral content, finely divided, and dark colored.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil, and carbon, hydrogen, and oxygen obtained largely from the air and water, are plant nutrients.

Overstory. The trees in a forest that form the upper crown cover. Contrasts with understory.

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Peat. Unconsolidated soil material, largely undecomposed organic matter, that has accumulated where there has been excess moisture.

Permeability, soil. The quality that enables a soil horizon to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely

neutral in reaction because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Release (forestry). To kill or remove nearby vegetation so as to free trees from competition.

Relief. The elevations or inequalities of a land surface, considered collectively.

Renovation. A method of restoring soils used for pasture or hay to higher productivity by cultivating them carefully so that the tillage will not cause erosion. The soils are then limed, fertilized, and reseeded.

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil forms.

Rill. A steep-sided channel resulting from accelerated erosion. A rill normally is a few inches in depth and width and is not large enough to be an obstacle to farm machinery.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Scalp (forestry). A small area from which sod and litter have been removed to provide a favorable planting site for a tree.

Seedling (forestry). A tree grown from seed; generally a young tree.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Solum, soil. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in a mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizonal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

Substratum. Any layer beneath the solum, or true soil.

Surface layer. A term used in nontechnical soil descriptions for one or more upper layers of soil. Includes the A horizon and can include part of the B horizon; has no depth limit.

Terrace, stream. An area above the present flood plain; it is generally underlain by stratified stream sediments.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland. Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Variant, soil. A soil that has many characteristics of the series in which it is placed but that differs in at least one important characteristic, indicated by its name. The acreage of a variant is of too small extent to justify establishing a new series. A new series may be designated and replace the variant, however, if sufficient acreage is later found.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables as follows:

Predicted yields of crops, table 1, page 12.
Estimated yields of wood products, table 2, page 17.
Engineering data and interpretations, table 3, page 18; table 4, page 20; table 5, page 24.
Acreage and extent of soils, table 6, page 38.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Woodland suitability group Number	Woodland suitability group Page
Ad	Alluvial land	37	IIIw-12	9	9	16
Al	Alluvial land, wet	37	Vw-14	9	9	16
Ar	Arenzville silt loam	39	IIw-11	7	1	15
AsB2	Ashdale silt loam, 2 to 6 percent slopes, moderately eroded	40	IIe-1	6	12	16
AsC2	Ashdale silt loam, 6 to 12 percent slopes, moderately eroded	40	IIIe-1	7	12	16
AsD2	Ashdale silt loam, 12 to 20 percent slopes, moderately eroded	40	IVe-1	9	12	16
AsD3	Ashdale silt loam, 12 to 20 percent slopes, severely eroded	40	VIe-1	10	12	16
Bo	Boaz silt loam	40	IIw-13	7	9	16
BsE	Boone loamy sand, 12 to 30 percent slopes	41	VIIs-9	11	4	16
BsF	Boone loamy sand, 30 to 45 percent slopes	41	VIIs-9	11	4	16
CaA	Chaseburg silt loam, 0 to 2 percent slopes	41	I-1	5	1	15
CaB	Chaseburg silt loam, 2 to 6 percent slopes	41	IIe-5	6	1	15
CaC	Chaseburg silt loam, 6 to 12 percent slopes	41	IIIe-5	8	1	15
DaA	Dakota sandy loam, 0 to 2 percent slopes	42	IIIe-4	7	3	15
DaB	Dakota sandy loam, 2 to 6 percent slopes	42	IIIe-4	7	3	15
DaB2	Dakota sandy loam, 2 to 6 percent slopes, moderately eroded	42	IIIe-4	7	3	15
DaC2	Dakota sandy loam, 6 to 12 percent slopes, moderately eroded	42	IVe-4	9	3	15
DdD2	Dodgeville silt loam, 12 to 20 percent slopes, moderately eroded	42	IVe-2	9	12	16
DmA	Downs-Tama silt loams, 0 to 2 percent slopes	42	I-1	5	12	16
DmB	Downs-Tama silt loams, 2 to 6 percent slopes	43	IIe-1	6	12	16
DmB2	Downs-Tama silt loams, 2 to 6 percent slopes, moderately eroded	43	IIe-1	6	12	16
DmC2	Downs-Tama silt loams, 6 to 12 percent slopes, moderately eroded	43	IIIe-1	7	12	16
DmD2	Downs-Tama silt loams, 12 to 20 percent slopes, moderately eroded	43	IVe-1	9	12	16
DsB	Dubuque silt loam, 2 to 6 percent slopes	43	IIe-2	6	1	15
DsB2	Dubuque silt loam, 2 to 6 percent slopes, moderately eroded	44	IIe-2	6	1	15
DsC	Dubuque silt loam, 6 to 12 percent slopes	44	IIIe-2	7	1	15
DsC2	Dubuque silt loam, 6 to 12 percent slopes, moderately eroded	44	IIIe-2	7	1	15
DsD	Dubuque silt loam, 12 to 20 percent slopes	44	IVe-2	9	1	15
DsD2	Dubuque silt loam, 12 to 20 percent slopes, moderately eroded	44	IVe-2	9	1	15
DsE	Dubuque silt loam, 20 to 30 percent slopes	44	VIe-2	10	1	15
DsE2	Dubuque silt loam, 20 to 30 percent slopes, moderately eroded	44	VIe-2	10	1	15
DsF	Dubuque silt loam, 30 to 45 percent slopes	44	VIIe-2	11	1	15
DtC3	Dubuque soils, 6 to 12 percent slopes, severely eroded	44	IVe-2	9	1	15
DtD3	Dubuque soils, 12 to 20 percent slopes, severely eroded	44	VIe-2	10	1	15
DtE3	Dubuque soils, 20 to 30 percent slopes, severely eroded	45	VIIe-2	11	1	15
DuB	Dubuque-Gale silt loams, 2 to 6 percent slopes	45	IIe-2	6	1	15
DuB2	Dubuque-Gale silt loams, 2 to 6 percent slopes, moderately eroded	45	IIe-2	6	1	15

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Woodland suitability group Number	Woodland suitability group Page
DuC2	Dubuque-Gale silt loams, 6 to 12 percent slopes, moderately eroded	45	IIIe-2	7	1	15
DuD2	Dubuque-Gale silt loams, 12 to 20 percent slopes, moderately eroded	45	IVe-2	9	1	15
DvD	Dunbarton and Sogn stony soils, 12 to 20 percent slopes	45	VIs-5	10	12	16
DvE	Dunbarton and Sogn stony soils, 20 to 30 percent slopes	45	VIIs-5	11	12	16
Et	Ettrick silt loam	45	IIw-1	6	9	16
FaA	Fayette silt loam, benches, 0 to 2 percent slopes	46	I-1	5	1	15
FaB	Fayette silt loam, benches, 2 to 6 percent slopes	47	IIe-1	6	1	15
FaB2	Fayette silt loam, benches, 2 to 6 percent slopes, moderately eroded	47	IIe-1	6	1	15
FaC2	Fayette silt loam, benches, 6 to 12 percent slopes, moderately eroded	47	IIIe-1	7	1	15
FuB	Fayette silt loam, uplands, 2 to 6 percent slopes	46	IIe-1	6	1	15
FuB2	Fayette silt loam, uplands, 2 to 6 percent slopes, moderately eroded	46	IIe-1	6	1	15
FuC	Fayette silt loam, uplands, 6 to 12 percent slopes	46	IIIe-1	7	1	15
FuC2	Fayette silt loam, uplands, 6 to 12 percent slopes, moderately eroded	46	IIIe-1	7	1	15
FuD	Fayette silt loam, uplands, 12 to 20 percent slopes	46	IVe-1	9	1	15
FuD2	Fayette silt loam, uplands, 12 to 20 percent slopes, moderately eroded	46	IVe-1	9	1	15
FuD3	Fayette silt loam, uplands, 12 to 20 percent slopes, severely eroded	46	VIe-1	10	1	15
FuE	Fayette silt loam, uplands, 20 to 30 percent slopes	46	VIe-1	10	1	15
FuE2	Fayette silt loam, uplands, 20 to 30 percent slopes, moderately eroded	46	VIe-1	10	1	15
FvC	Fayette silt loam, valleys, 6 to 12 percent slopes	47	IIIe-1	7	1	15
FvC2	Fayette silt loam, valleys, 6 to 12 percent slopes, moderately eroded	47	IIIe-1	7	1	15
FvD	Fayette silt loam, valleys, 12 to 20 percent slopes	47	IVe-1	9	1	15
FvD2	Fayette silt loam, valleys, 12 to 20 percent slopes, moderately eroded	47	IVe-1	9	1	15
FvE	Fayette silt loam, valleys, 20 to 30 percent slopes	48	VIe-1	10	1	15
FvE2	Fayette silt loam, valleys, 20 to 30 percent slopes, moderately eroded	48	VIIe-1	11	1	15
FvF	Fayette silt loam, valleys, 30 to 45 percent slopes	48	VIIe-1	11	1	15
GaB2	Gale silt loam, 2 to 6 percent slopes, moderately eroded	48	IIe-2	6	1	15
GaC2	Gale silt loam, 6 to 12 percent slopes, moderately eroded	48	IIIe-2	7	1	15
GaD2	Gale silt loam, 12 to 20 percent slopes, moderately eroded	48	IVe-2	9	1	15
GaE	Gale silt loam, 20 to 30 percent slopes	48	VIe-2	10	1	15
GaE2	Gale silt loam, 20 to 30 percent slopes, moderately eroded	49	VIe-2	10	1	15
GaF	Gale silt loam, 30 to 45 percent slopes	49	VIIe-2	11	1	15
Gu	Gullied land	49	VIIe-4	11	11	16
HlC2	Hixton loam, 6 to 12 percent slopes, moderately eroded	49	IIIe-2	7	3	15
HlD2	Hixton loam, 12 to 20 percent slopes, moderately eroded	49	IVe-2	9	3	15
HlE2	Hixton loam, 20 to 30 percent slopes, moderately eroded	49	VIe-2	10	3	15
HsC2	Hixton sandy loam, 6 to 12 percent slopes, moderately eroded	49	IVe-4	9	3	15
HsD2	Hixton sandy loam, 12 to 20 percent slopes, moderately eroded	50	VIe-4	10	3	15
HsE	Hixton sandy loam, 20 to 30 percent slopes	50	VIIe-4	11	3	15
HsE2	Hixton sandy loam, 20 to 30 percent slopes, moderately eroded	50	VIIe-4	11	3	15
HtF	Hixton soils, 30 to 45 percent slopes	50	VIIe-4	11	3	15
Hu	Houghton muck	50	IIIw-9	9	10	16
Hv	Huntsville silt loam	50	IIw-11	7	12	16
Kp	Kickapoo fine sandy loam	51	IIIw-12	9	1	15

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Woodland suitability group Number	Woodland suitability group Page
Ls	Lawson silt loam	51	IIw-13	7	12	16
LtC2	Lindstrom silt loam, 6 to 12 percent slopes, moderately eroded	51	IIIe-1	7	12	16
LtD2	Lindstrom silt loam, 12 to 20 percent slopes, moderately eroded	52	IVe-1	9	12	16
LtE2	Lindstrom silt loam, 20 to 30 percent slopes, moderately eroded	52	VIe-1	10	12	16
Ma	Marsh	52	VIIIw-15	11	11	16
MeA	Medary silt loam, 0 to 2 percent slopes	52	IIs-7	7	2	15
MeB2	Medary silt loam, 2 to 6 percent slopes, eroded	52	IIe-1	6	2	15
MuA	Muscatine silt loam, benches, 0 to 2 percent slopes	53	IIw-2	7	12	16
MuB	Muscatine silt loam, benches, 2 to 6 percent slopes	53	IIw-2	7	12	16
NfD2	Norden fine sandy loam, 12 to 20 percent slopes, moderately eroded	53	IVe-2	9	3	15
NfE	Norden fine sandy loam, 20 to 30 percent slopes	53	VIe-2	10	3	15
NfE2	Norden fine sandy loam, 20 to 30 percent slopes, moderately eroded	53	VIe-2	10	3	15
NfF	Norden fine sandy loam, 30 to 45 percent slopes	53	VIIe-2	11	3	15
NlC2	Norden loam, 6 to 12 percent slopes, moderately eroded	53	IIIe-2	7	1	15
NlD	Norden loam, 12 to 20 percent slopes	53	IVe-2	9	1	15
NlD2	Norden loam, 12 to 20 percent slopes, moderately eroded	53	IVe-2	9	1	15
NlE	Norden loam, 20 to 30 percent slopes	54	VIe-2	10	1	15
NlE2	Norden loam, 20 to 30 percent slopes, moderately eroded	54	VIe-2	10	1	15
NoB2	Norden silt loam, 2 to 6 percent slopes, moderately eroded	54	IIe-2	6	1	15
NoC2	Norden silt loam, 6 to 12 percent slopes, moderately eroded	54	IIIe-2	7	1	15
NoD	Norden silt loam, 12 to 20 percent slopes	54	IVe-2	9	1	15
NoD2	Norden silt loam, 12 to 20 percent slopes, moderately eroded	54	IVe-2	9	1	15
NoE	Norden silt loam, 20 to 30 percent slopes	54	VIe-2	10	1	15
NoE2	Norden silt loam, 20 to 30 percent slopes, moderately eroded	55	VIe-2	10	1	15
NoF	Norden silt loam, 30 to 45 percent slopes	55	VIIe-2	11	1	15
NwB2	Norwalk silt loam, 2 to 6 percent slopes, eroded	55	IIe-2	6	1	15
NwC2	Norwalk silt loam, 6 to 12 percent slopes, moderately eroded	55	IIIe-2	7	1	15
NwD2	Norwalk silt loam, 12 to 20 percent slopes, moderately eroded	55	IVe-2	9	1	15
Or	Orion silt loam	55	IIw-13	7	9	16
Ow	Orion silt loam, wet	56	Vw-14	9	9	16
PaB	Palsgrove silt loam, 2 to 6 percent slopes	56	IIe-1	6	1	15
PaB2	Palsgrove silt loam, 2 to 6 percent slopes, moderately eroded	56	IIe-1	6	1	15
PaC	Palsgrove silt loam, 6 to 12 percent slopes	56	IIIe-1	7	1	15
PaC2	Palsgrove silt loam, 6 to 12 percent slopes, moderately eroded	56	IIIe-1	7	1	15
PaD	Palsgrove silt loam, 12 to 20 percent slopes	56	IVe-1	9	1	15
PaD2	Palsgrove silt loam, 12 to 20 percent slopes, moderately eroded	56	IVe-1	9	1	15
PaD3	Palsgrove silt loam, 12 to 20 percent slopes, severely eroded	56	VIe-1	10	1	15
PaE	Palsgrove silt loam, 20 to 30 percent slopes	57	VIe-1	10	1	15
PaE2	Palsgrove silt loam, 20 to 30 percent slopes, moderately eroded	57	VIe-1	10	1	15
RbC2	Rockbridge silt loam, 6 to 12 percent slopes, moderately eroded	57	IIIe-2	7	1	15
RbD2	Rockbridge silt loam, 12 to 20 percent slopes, moderately eroded	57	IVe-2	9	1	15
RoA	Rozetta silt loam, benches, 0 to 2 percent slopes	57	I-1	5	1	15
RoB	Rozetta silt loam, benches, 2 to 6 percent slopes	57	IIe-1	6	1	15

GUIDE TO MAPPING UNITS--CONTINUED

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group	
			Symbol	Page	Number	Page
SaA	Sparta loamy sand, 0 to 2 percent slopes	58	IVs-3	9	4	16
SaB2	Sparta loamy sand, 2 to 6 percent slopes, eroded	58	IVs-3	9	4	16
SaC2	Sparta loamy sand, 6 to 12 percent slopes, eroded	58	VIs-3	10	4	16
ScB	Stony colluvial land, gently sloping	58	Vw-16	10	13	17
ScC	Stony colluvial land, sloping	58	VIs-6	10	13	17
SkE	Stony rock land, moderately steep	58	VIs-6	10	13	17
SkF	Stony rock land, steep	59	VIIs-6	11	13	17
StB2	Stronghurst silt loam, 2 to 6 percent slopes, moderately eroded	59	IIw-2	7	7	16
StC2	Stronghurst silt loam, 6 to 12 percent slopes, moderately eroded	59	IIIe-8	8	7	16
SuA	Stronghurst silt loam, benches, 0 to 2 percent slopes	59	IIw-2	7	7	16
SuB	Stronghurst silt loam, benches, 2 to 6 percent slopes	59	IIw-2	7	7	16
TaA	Tama silt loam, benches, 0 to 2 percent slopes	59	I-1	5	12	16
TaB	Tama silt loam, benches, 2 to 6 percent slopes	59	IIe-1	6	12	16
TaC2	Tama silt loam, benches, 6 to 12 percent slopes, moderately eroded	60	IIIe-1	7	12	16
TeB2	Tell silt loam, 2 to 6 percent slopes, eroded	60	IIe-2	6	1	15
TeC2	Tell silt loam, 6 to 12 percent slopes, moderately eroded	60	IIIe-2	7	1	15
TeD2	Tell silt loam, 12 to 20 percent slopes, moderately eroded	60	IVe-2	9	1	15
Tr	Terrace escarpments, loamy	61	VIe-2	10	3	15
Ts	Terrace escarpments, sandy	61	VIIs-5	11	4	16
WcB	Worthen cherty silt loam, 2 to 6 percent slopes	61	IIe-5	6	12	16
WcC	Worthen cherty silt loam, 6 to 12 percent slopes	61	IIIe-5	8	12	16
WcD	Worthen cherty silt loam, 12 to 20 percent slopes	61	IVe-1	9	12	16
WoA	Worthen silt loam, 0 to 2 percent slopes	61	I-1	5	12	16
WoB	Worthen silt loam, 2 to 6 percent slopes	61	IIe-5	6	12	16
WoC	Worthen silt loam, 6 to 12 percent slopes	61	IIIe-5	8	12	16

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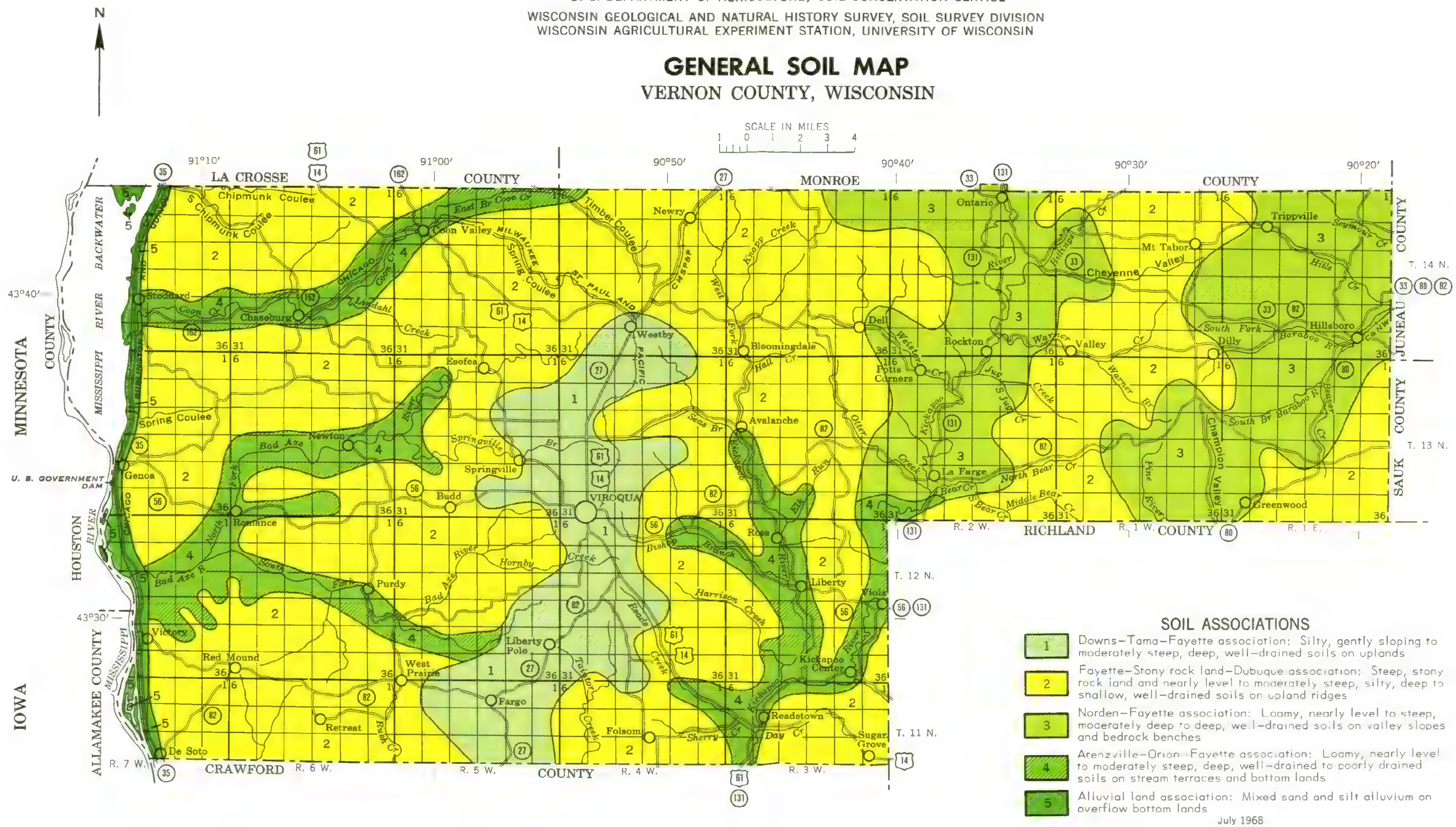
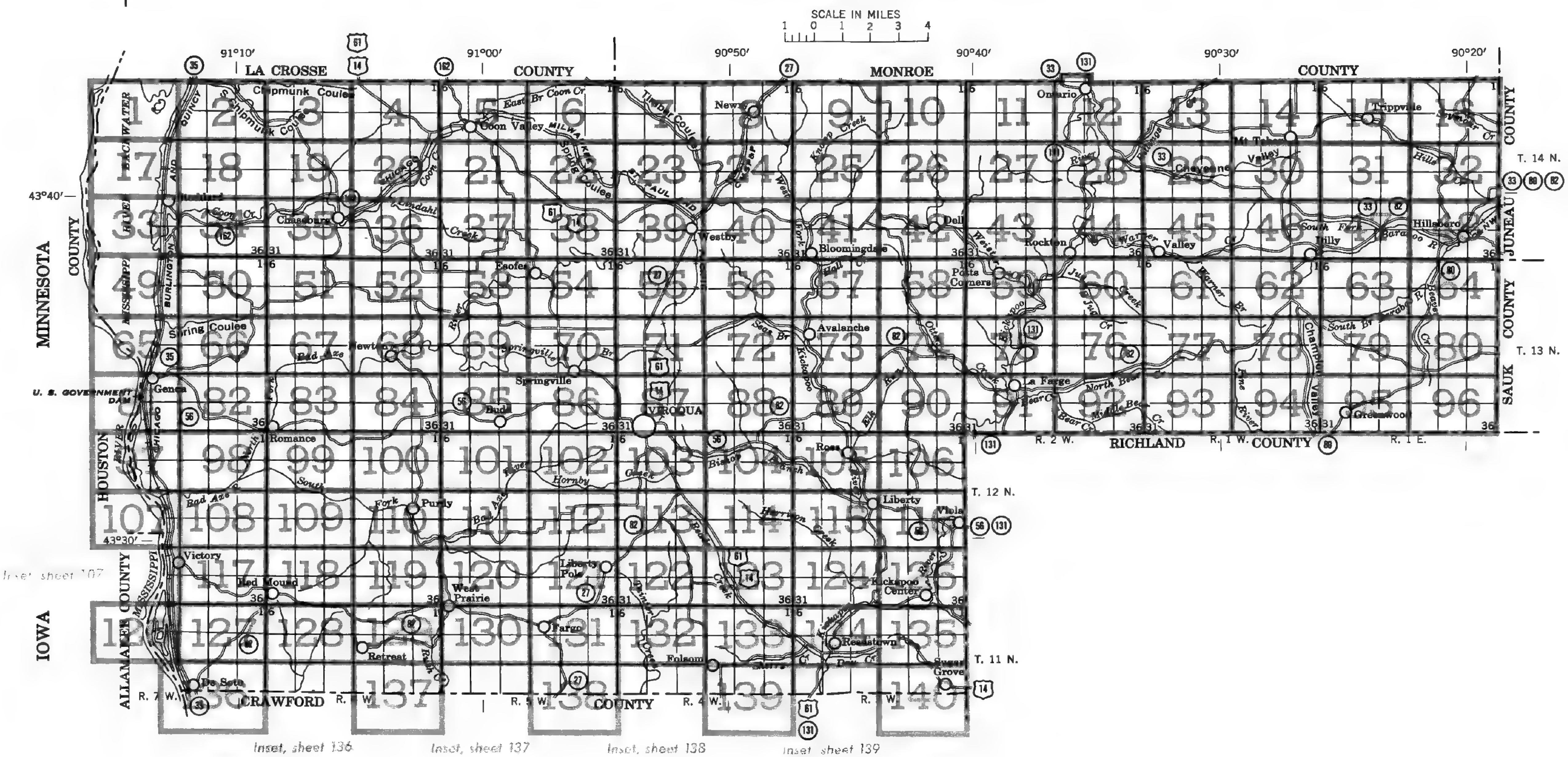
U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY, SOIL SURVEY DIVISION
WISCONSIN AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF WISCONSIN

GENERAL SOIL MAP

VERNON COUNTY, WISCONSIN



INDEX TO MAP SHEETS
VERNON COUNTY, WISCONSIN



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

VERNON COUNTY, WISCONSIN

UNIVERSITY OF WISCONSIN
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY
SOIL SURVEY DIVISION, AND WISCONSIN AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for land types that have a considerable range in slope. Soils that are named as moderately eroded or severely eroded have a final number, 2 or 3, in their symbol.

SYMBOL	NAME
Ad	Alluvial land
Al	Alluvial land, wet
Ar	Arenzville silt loam
AsB2	Ashdale silt loam, 2 to 6 percent slopes, moderately eroded
AsC2	Ashdale silt loam, 6 to 12 percent slopes, moderately eroded
AsD2	Ashdale silt loam, 12 to 20 percent slopes, moderately eroded
AsD3	Ashdale silt loam, 12 to 20 percent slopes, severely eroded
Bo	Booz silt loam
BsE	Boone loamy sand, 12 to 30 percent slopes
BsF	Boone loamy sand, 30 to 45 percent slopes
CaA	Chaseburg silt loam, 0 to 2 percent slopes
CaB	Chaseburg silt loam, 2 to 6 percent slopes
CaC	Chaseburg silt loam, 6 to 12 percent slopes
DaA	Dakota sandy loam, 0 to 2 percent slopes
DaB	Dakota sandy loam, 2 to 6 percent slopes
DaB2	Dakota sandy loam, 2 to 6 percent slopes, moderately eroded
DaC2	Dakota sandy loam, 6 to 12 percent slopes, moderately eroded
DdD2	Dodgeville silt loam, 12 to 20 percent slopes, moderately eroded
DmA	Downs–Tama silt loams, 0 to 2 percent slopes
DmB	Downs–Tama silt loams, 2 to 6 percent slopes
DmB2	Downs–Tama silt loams, 2 to 6 percent slopes, moderately eroded
DmC2	Downs–Tama silt loams, 6 to 12 percent slopes, moderately eroded
DmD2	Downs–Tama silt loams, 12 to 20 percent slopes, moderately eroded
DsB	Dubuque silt loam, 2 to 6 percent slopes
DsB2	Dubuque silt loam, 2 to 6 percent slopes, moderately eroded
DsC	Dubuque silt loam, 6 to 12 percent slopes
DsC2	Dubuque silt loam, 6 to 12 percent slopes, moderately eroded
DsD	Dubuque silt loam, 12 to 20 percent slopes
DsD2	Dubuque silt loam, 12 to 20 percent slopes, moderately eroded
DsE	Dubuque silt loam, 20 to 30 percent slopes
DsE2	Dubuque silt loam, 20 to 30 percent slopes, moderately eroded
DsF	Dubuque silt loam, 30 to 45 percent slopes
DtC3	Dubuque soils, 6 to 12 percent slopes, severely eroded
DtD3	Dubuque soils, 12 to 20 percent slopes, severely eroded
DtE3	Dubuque soils, 20 to 30 percent slopes, severely eroded
DuB	Dubuque–Gale silt loams, 2 to 6 percent slopes
DuB2	Dubuque–Gale silt loams, 2 to 6 percent slopes, moderately eroded
DuC2	Dubuque–Gale silt loams, 6 to 12 percent slopes, moderately eroded
DuD2	Dubuque–Gale silt loams, 12 to 20 percent slopes, moderately eroded
DvD	Dunbarton and Sogn stony soils, 12 to 20 percent slopes
DvE	Dunbarton and Sogn stony soils, 20 to 30 percent slopes
Et	Ettrick silt loam
FaA	Fayette silt loam, benches, 0 to 2 percent slopes
FaB	Fayette silt loam, benches, 2 to 6 percent slopes
FaB2	Fayette silt loam, benches, 2 to 6 percent slopes, moderately eroded
FaC2	Fayette silt loam, benches, 6 to 12 percent slopes, moderately eroded
FuB	Fayette silt loam, uplands, 2 to 6 percent slopes
FuB2	Fayette silt loam, uplands, 2 to 6 percent slopes, moderately eroded
FuC	Fayette silt loam, uplands, 6 to 12 percent slopes
FuC2	Fayette silt loam, uplands, 6 to 12 percent slopes, moderately eroded
FuD	Fayette silt loam, uplands, 12 to 20 percent slopes
FuD2	Fayette silt loam, uplands, 12 to 20 percent slopes, moderately eroded

SYMBOL	NAME
FuD3	Fayette silt loam, uplands, 12 to 20 percent slopes, severely eroded
FuE	Fayette silt loam, uplands, 20 to 30 percent slopes
FuE2	Fayette silt loam, uplands, 20 to 30 percent slopes, moderately eroded
FvC	Fayette silt loam, valleys, 6 to 12 percent slopes
FvC2	Fayette silt loam, valleys, 6 to 12 percent slopes, moderately eroded
FvD	Fayette silt loam, valleys, 12 to 20 percent slopes
FvD2	Fayette silt loam, valleys, 12 to 20 percent slopes, moderately eroded
FvE	Fayette silt loam, valleys, 20 to 30 percent slopes
FvE2	Fayette silt loam, valleys, 20 to 30 percent slopes, moderately eroded
FvF	Fayette silt loam, valleys, 30 to 45 percent slopes
GaB2	Gale silt loam, 2 to 6 percent slopes, moderately eroded
GaC2	Gale silt loam, 6 to 12 percent slopes, moderately eroded
GaD2	Gale silt loam, 12 to 20 percent slopes, moderately eroded
GaE	Gale silt loam, 20 to 30 percent slopes
GaE2	Gale silt loam, 20 to 30 percent slopes, moderately eroded
GaF	Gale silt loam, 30 to 45 percent slopes
Gu	Gullied land
HlC2	Hixton loam, 6 to 12 percent slopes, moderately eroded
HlD2	Hixton loam, 12 to 20 percent slopes, moderately eroded
HlE2	Hixton loam, 20 to 30 percent slopes, moderately eroded
HsC2	Hixton sandy loam, 6 to 12 percent slopes, moderately eroded
HsD2	Hixton sandy loam, 12 to 20 percent slopes, moderately eroded
HsE	Hixton sandy loam, 20 to 30 percent slopes
HsE2	Hixton sandy loam, 20 to 30 percent slopes, moderately eroded
HtF	Hixton soils, 30 to 45 percent slopes
Hu	Houghton muck
Hv	Huntsville silt loam
Kp	Kickapoo fine sandy loam
Ls	Lawson silt loam
LtC2	Lindstrom silt loam, 6 to 12 percent slopes, moderately eroded
LtD2	Lindstrom silt loam, 12 to 20 percent slopes, moderately eroded
LtE2	Lindstrom silt loam, 20 to 30 percent slopes, moderately eroded
Ma	Marsh
MeA	Meary silt loam, 0 to 2 percent slopes
MeB2	Meary silt loam, 2 to 6 percent slopes, eroded
MuA	Muscatine silt loam, benches, 0 to 2 percent slopes
MuB	Muscatine silt loam, benches, 2 to 6 percent slopes
NfD2	Norden fine sandy loam, 12 to 20 percent slopes, moderately eroded
NfE	Norden fine sandy loam, 20 to 30 percent slopes
NfE2	Norden fine sandy loam, 20 to 30 percent slopes, moderately eroded
NfF	Norden fine sandy loam, 30 to 45 percent slopes
NlC2	Norden loam, 6 to 12 percent slopes, moderately eroded
NlD	Norden loam, 12 to 20 percent slopes
NlD2	Norden loam, 12 to 20 percent slopes, moderately eroded
NlE	Norden loam, 20 to 30 percent slopes
NlE2	Norden loam, 20 to 30 percent slopes, moderately eroded
NoB2	Norden silt loam, 2 to 6 percent slopes, moderately eroded
NoC2	Norden silt loam, 6 to 12 percent slopes, moderately eroded
NoD	Norden silt loam, 12 to 20 percent slopes
NoD2	Norden silt loam, 12 to 20 percent slopes, moderately eroded

SYMBOL	NAME
NoE	Norden silt loam, 20 to 30 percent slopes
NoE2	Norden silt loam, 20 to 30 percent slopes, moderately eroded
NoF	Norden silt loam, 30 to 45 percent slopes
NwB2	Norwalk silt loam, 2 to 6 percent slopes, eroded
NwC2	Norwalk silt loam, 6 to 12 percent slopes, moderately eroded
NwD2	Norwalk silt loam, 12 to 20 percent slopes, moderately eroded
Or	Orion silt loam
Ow	Orion silt loam, wet
PaB	Palsgrove silt loam, 2 to 6 percent slopes
PaB2	Palsgrove silt loam, 2 to 6 percent slopes, moderately eroded
PaC	Palsgrove silt loam, 6 to 12 percent slopes
PaC2	Palsgrove silt loam, 6 to 12 percent slopes, moderately eroded
PaD	Palsgrove silt loam, 12 to 20 percent slopes
PaD2	Palsgrove silt loam, 12 to 20 percent slopes, moderately eroded
PaD3	Palsgrove silt loam, 12 to 20 percent slopes, severely eroded
PaE	Palsgrove silt loam, 20 to 30 percent slopes
PaE2	Palsgrove silt loam, 20 to 30 percent slopes, moderately eroded
RbC2	Rockbridge silt loam, 6 to 12 percent slopes, moderately eroded
RbD2	Rockbridge silt loam, 12 to 20 percent slopes, moderately eroded
RoA	Rozetta silt loam, benches, 0 to 2 percent slopes
RoB	Rozetta silt loam, benches, 2 to 6 percent slopes
SaA	Sparta loamy sand, 0 to 2 percent slopes
SaB2	Sparta loamy sand, 2 to 6 percent slopes, eroded
SaC2	Sparta loamy sand, 6 to 12 percent slopes, eroded
ScB	Stony colluvial land, gently sloping
ScC	Stony colluvial land, sloping
SkE	Stony rock land, moderately steep
SkF	Stony rock land, steep
StB2	Stronghurst silt loam, 2 to 6 percent slopes, moderately eroded
StC2	Stronghurst silt loam, 6 to 12 percent slopes, moderately eroded
SuA	Stronghurst silt loam, benches, 0 to 2 percent slopes
SuB	Stronghurst silt loam, benches, 2 to 6 percent slopes
TaA	Tama silt loam, benches, 0 to 2 percent slopes
TaB	Tama silt loam, benches, 2 to 6 percent slopes
TaC2	Tama silt loam, benches, 6 to 12 percent slopes, moderately eroded
TeB2	Tell silt loam, 2 to 6 percent slopes, eroded
TeC2	Tell silt loam, 6 to 12 percent slopes, moderately eroded
TeD2	Tell silt loam, 12 to 20 percent slopes, moderately eroded
Tr	Terrace escarpments, loamy
Ts	Terrace escarpments, sandy
WcB	Worthen cherty silt loam, 2 to 6 percent slopes
WcC	Worthen cherty silt loam, 6 to 12 percent slopes
WcD	Worthen cherty silt loam, 12 to 20 percent slopes
WoA	Worthen silt loam, 0 to 2 percent slopes
WoB	Worthen silt loam, 2 to 6 percent slopes
WoC	Worthen silt loam, 6 to 12 percent slopes

Soil map constructed 1967 by Cartographic Division, Soil Conservation Service, USDA, from 1961 aerial photographs. Controlled mosaic based on Wisconsin plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.

VERNON COUNTY, WISCONSIN
CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Dual
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State or county

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail, foot
- Railroad
- Ferry — FY
- Ford — FORD
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings

- School
- Church
- Creamery

Mines and Quarries

Mine dump

Pit, gravel

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches — CANAL

Lakes and ponds

- Perennial — water, w
- Intermittent

Wells, water — flowing

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments

- Bedrock
- Other

Prominent peak

Depressions — Large, Small

- Crossable with tillage implements
- Not crossable with tillage implements

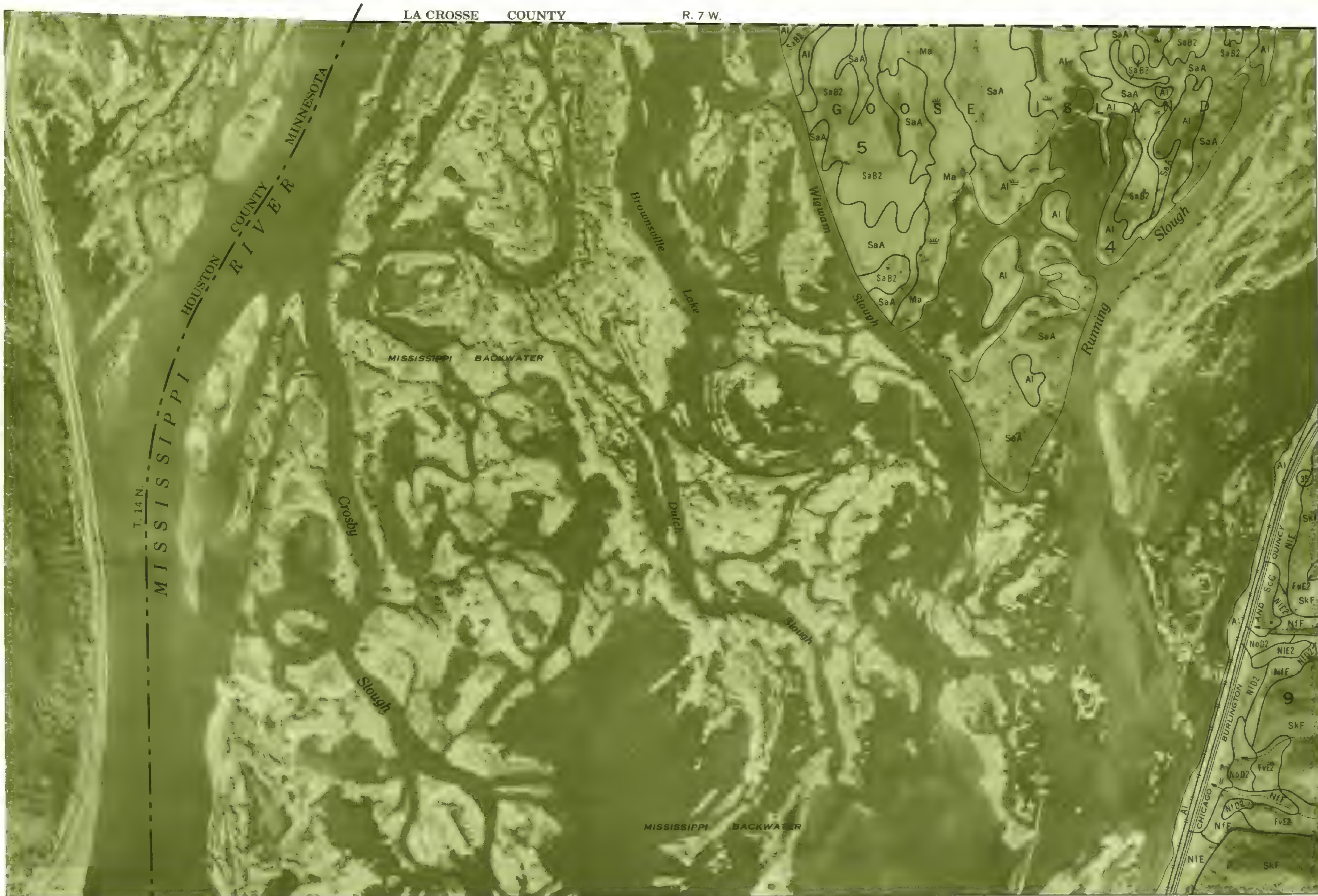
SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stony, very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

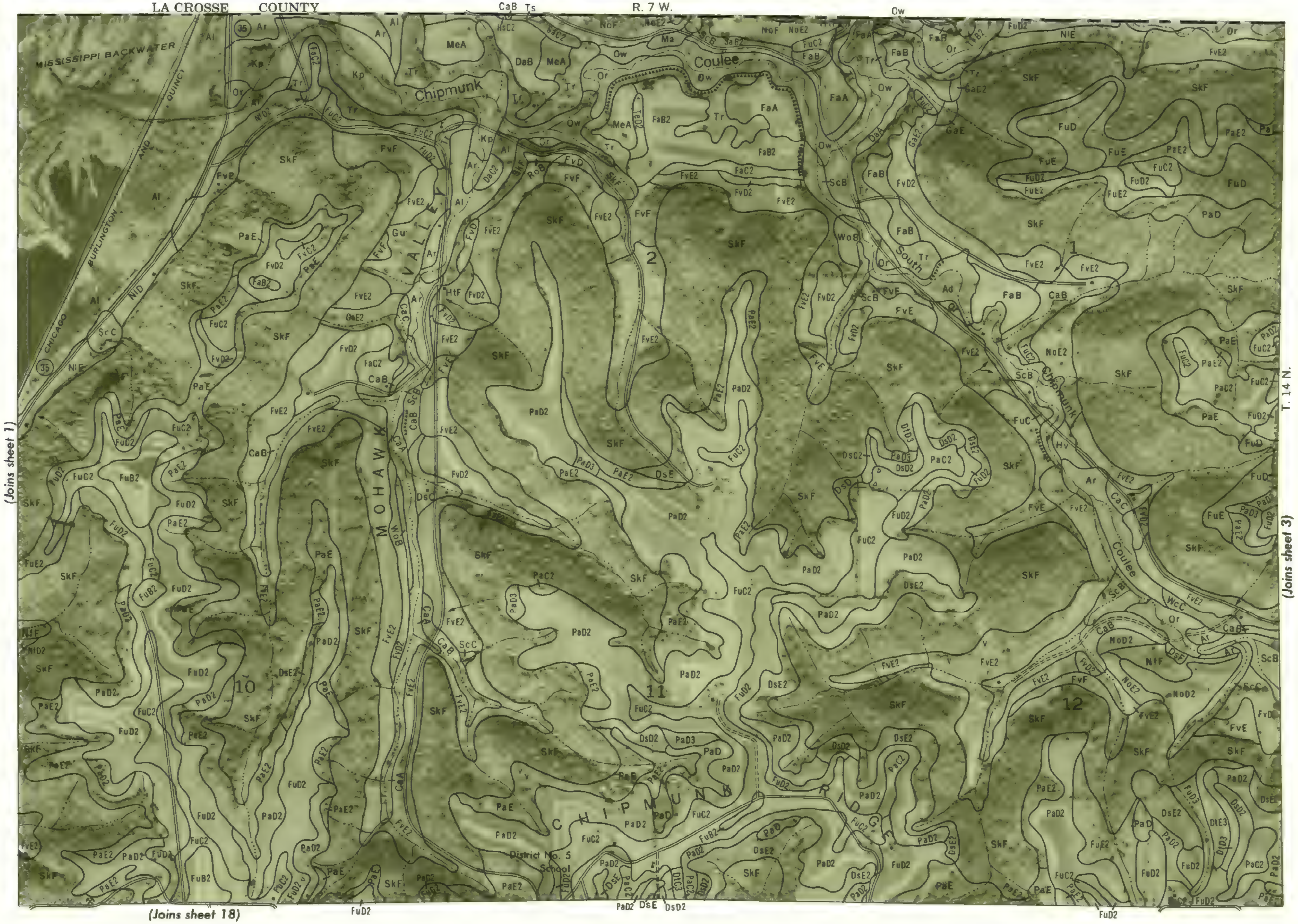
VERNON COUNTY, WISCONSIN NO. 1



(Joins sheet 17)

0 ½ Mile Scale 1:15840 0 3000 Feet

N



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 2

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

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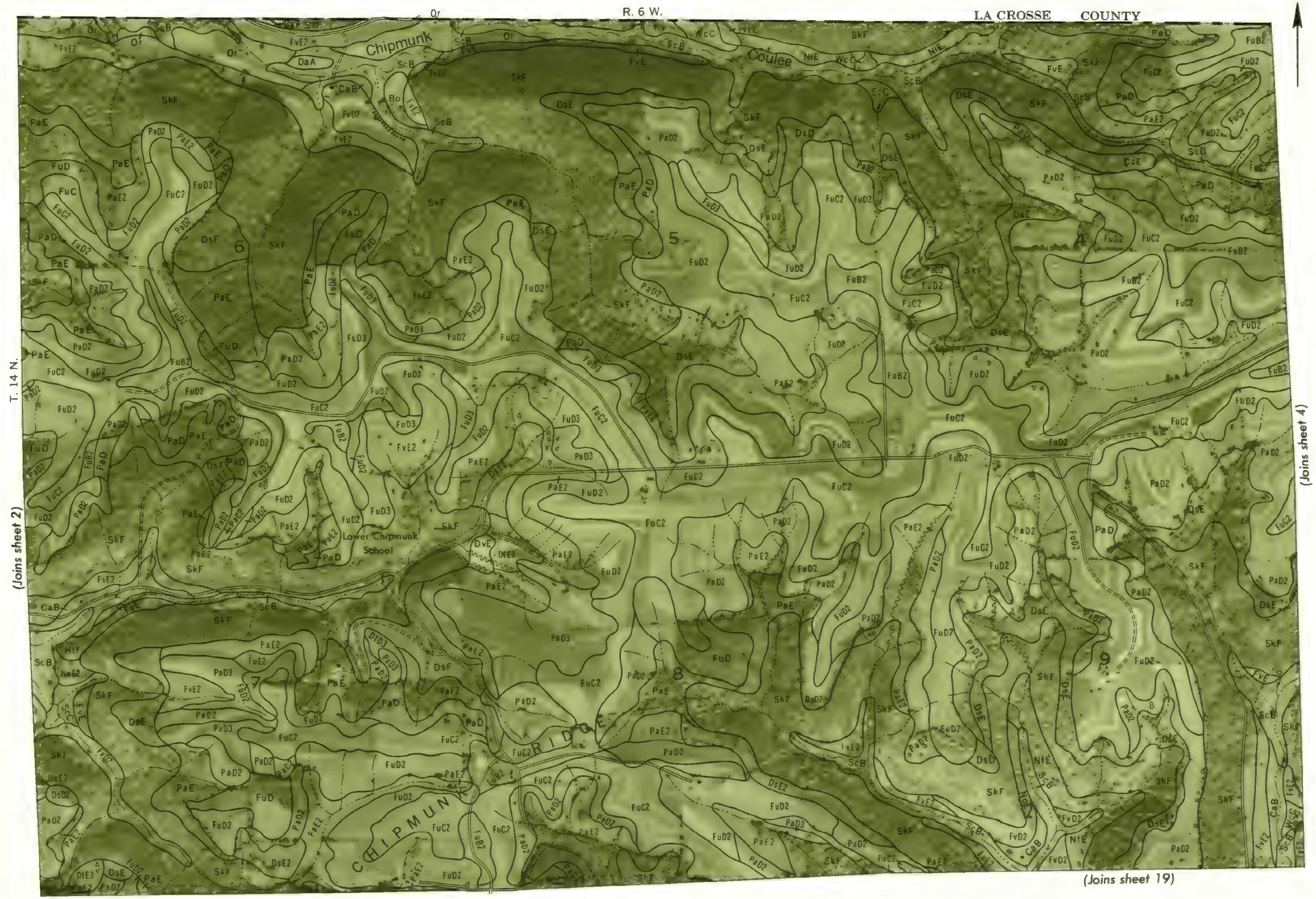
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 3

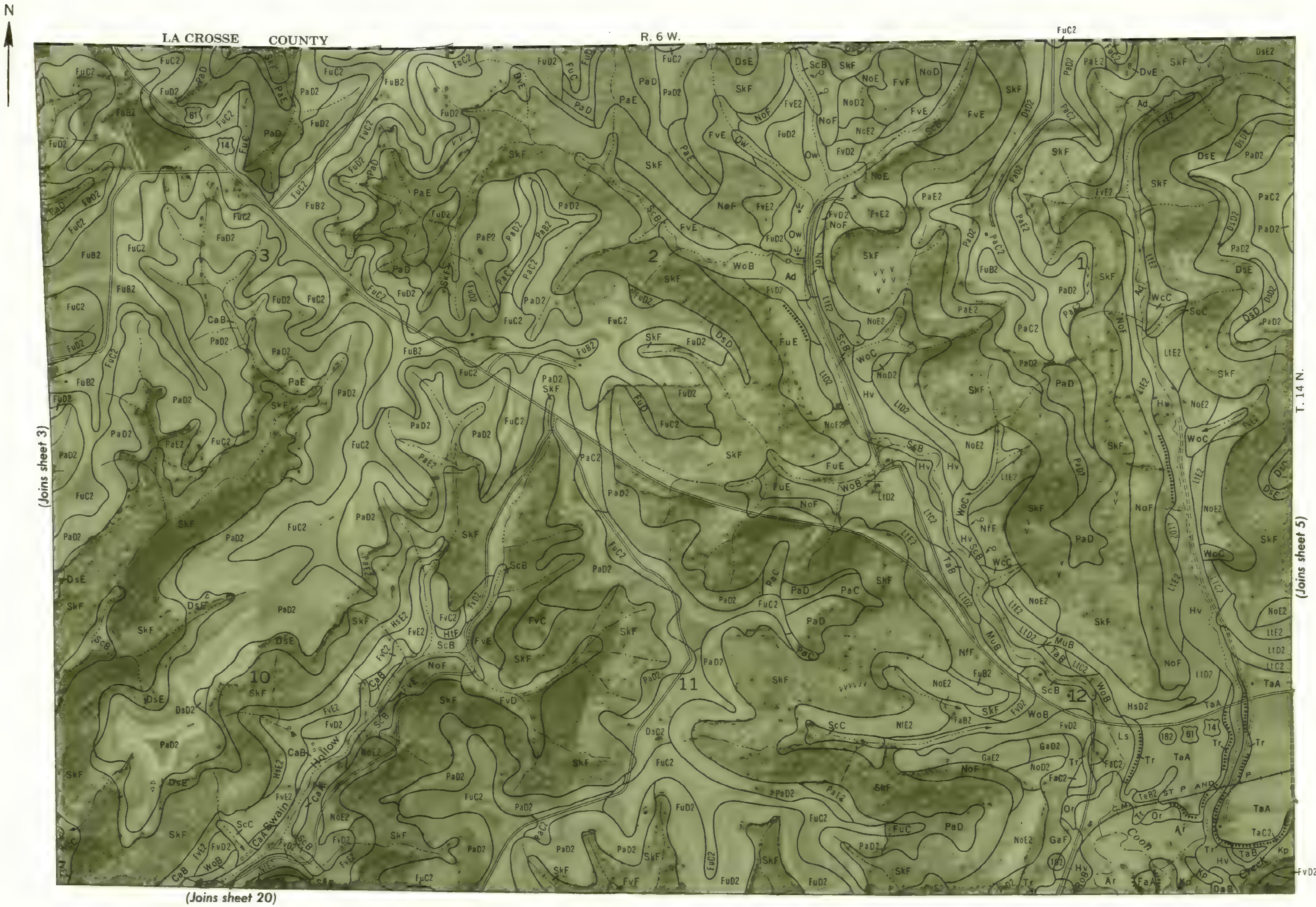
N



0 ½ Mile Scale 1:15840 0 3000 Feet

④

VERNON COUNTY, WISCONSIN — SHEET NUMBER 4



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 4

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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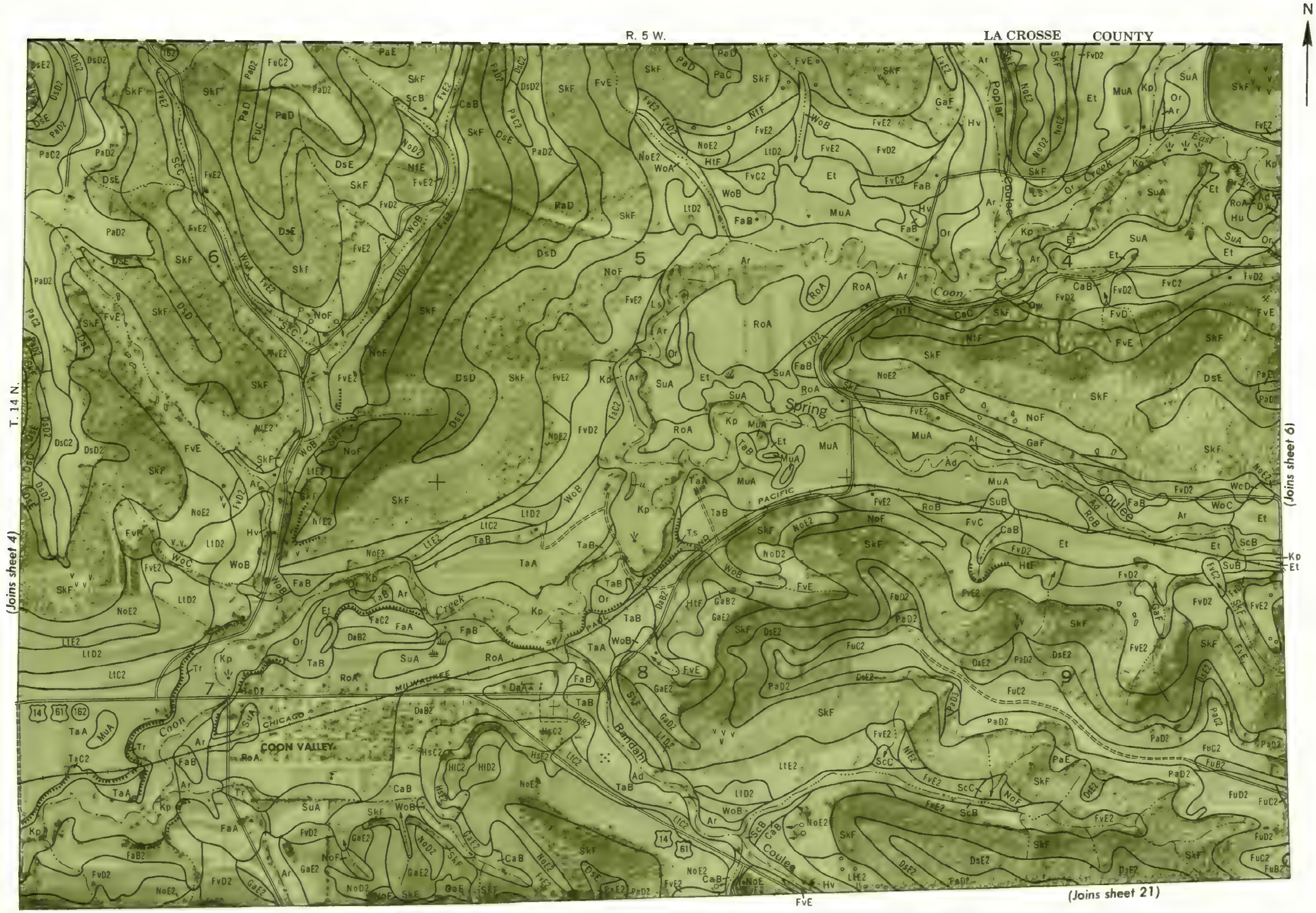
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN, NO. 5



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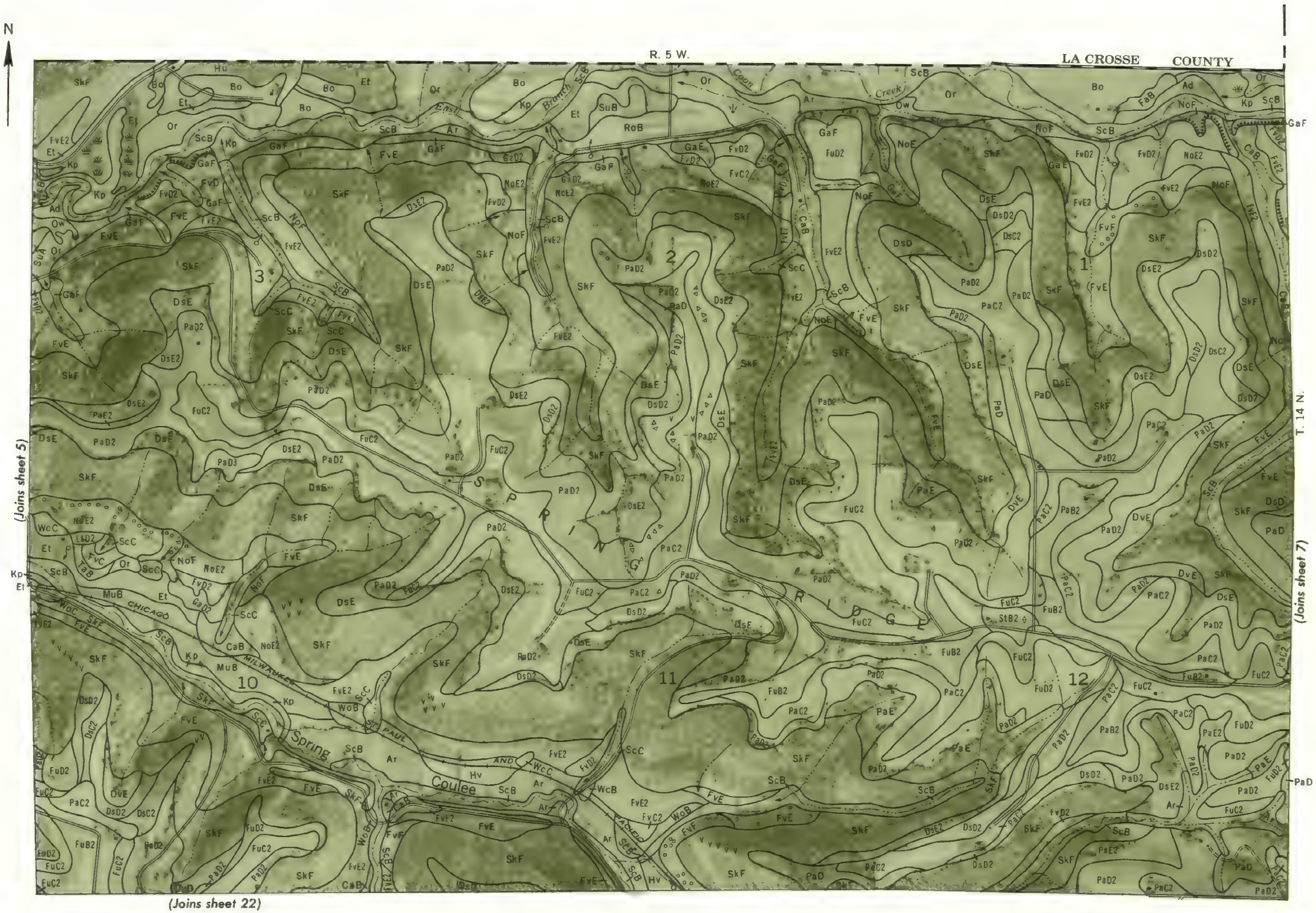
⑥

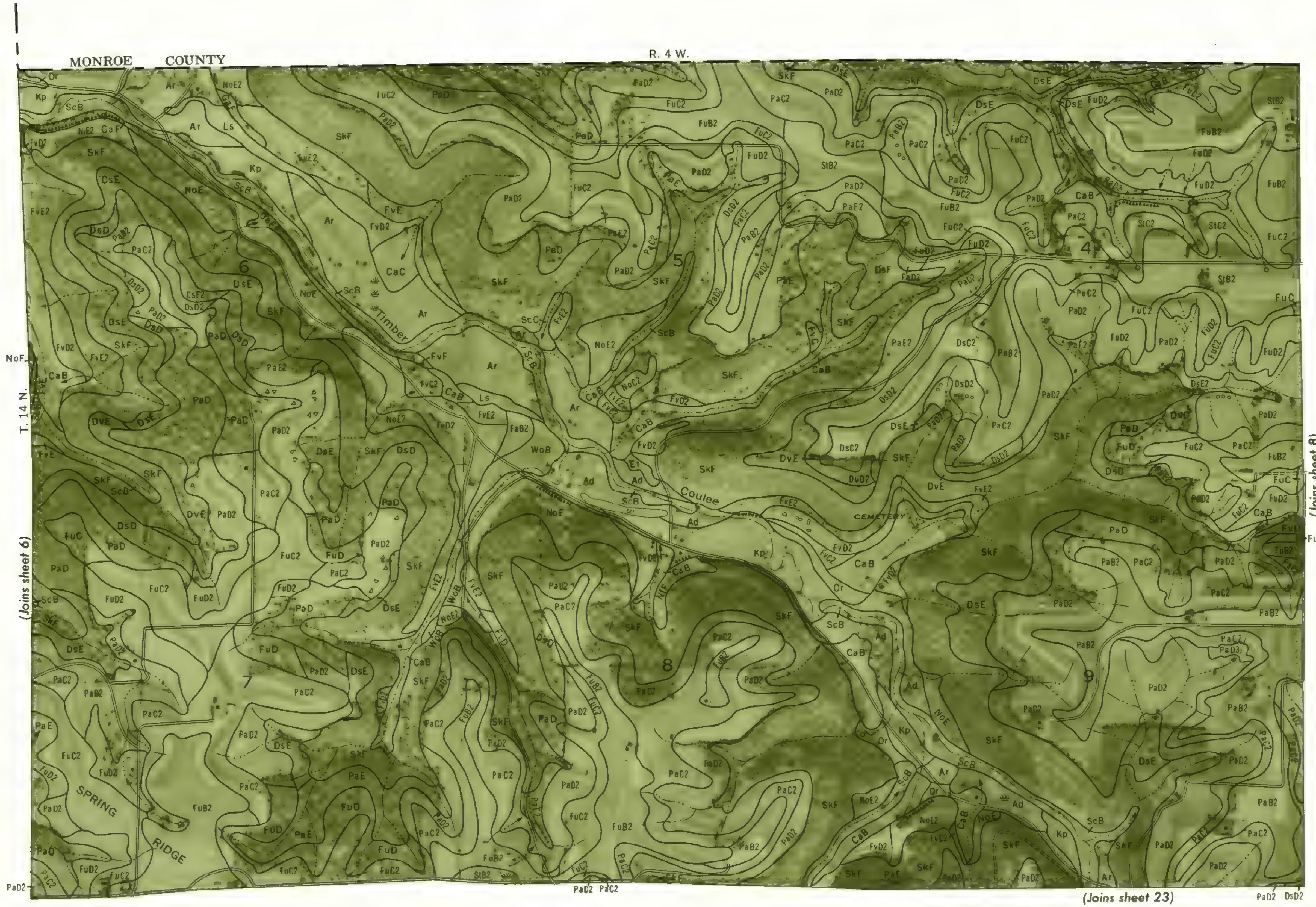


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 6

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



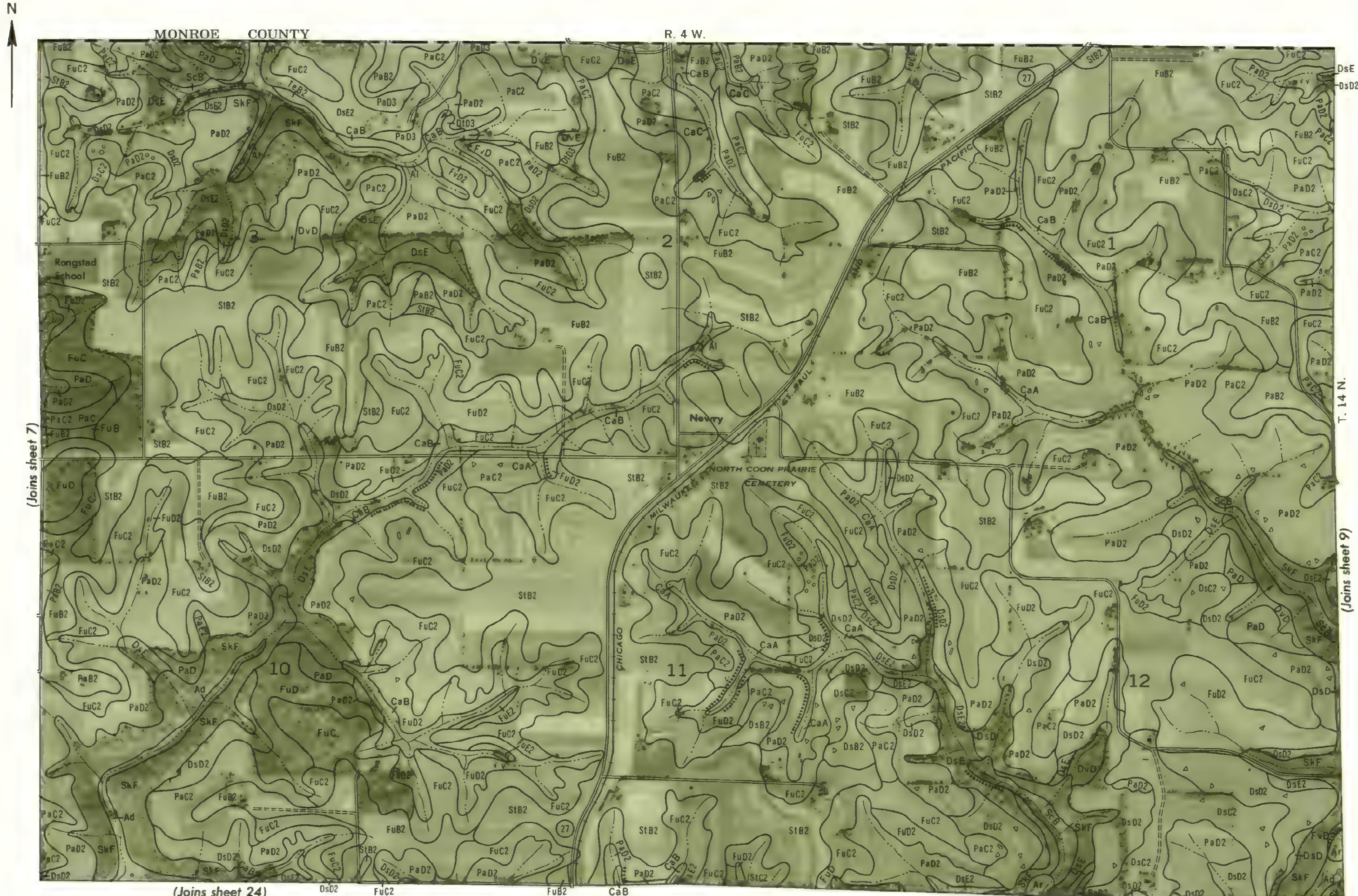
0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 7

VERNON COUNTY, WISCONSIN — SHEET NUMBER 8



Scale 1:15840

0 ½ Mile

0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 8

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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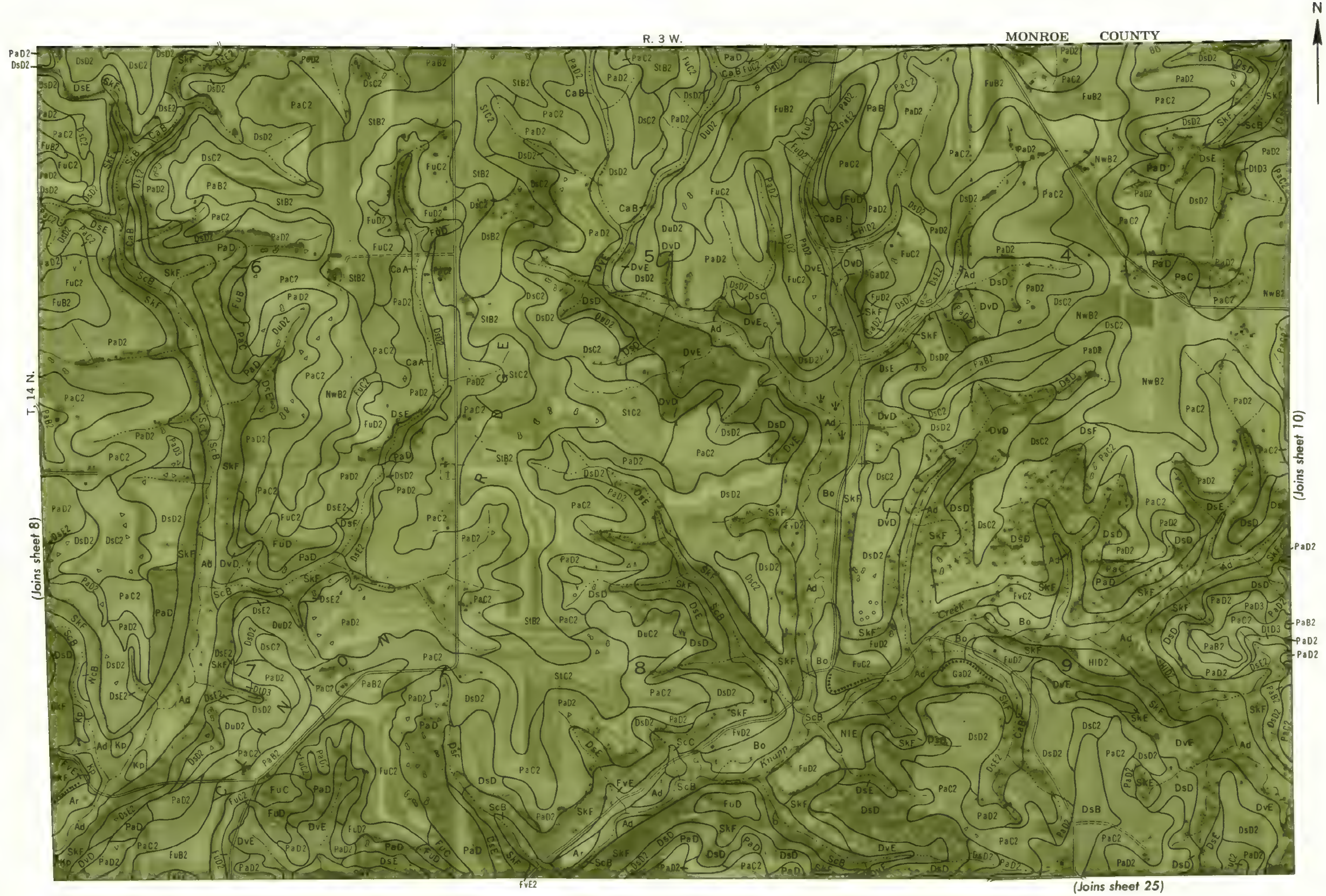
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 9



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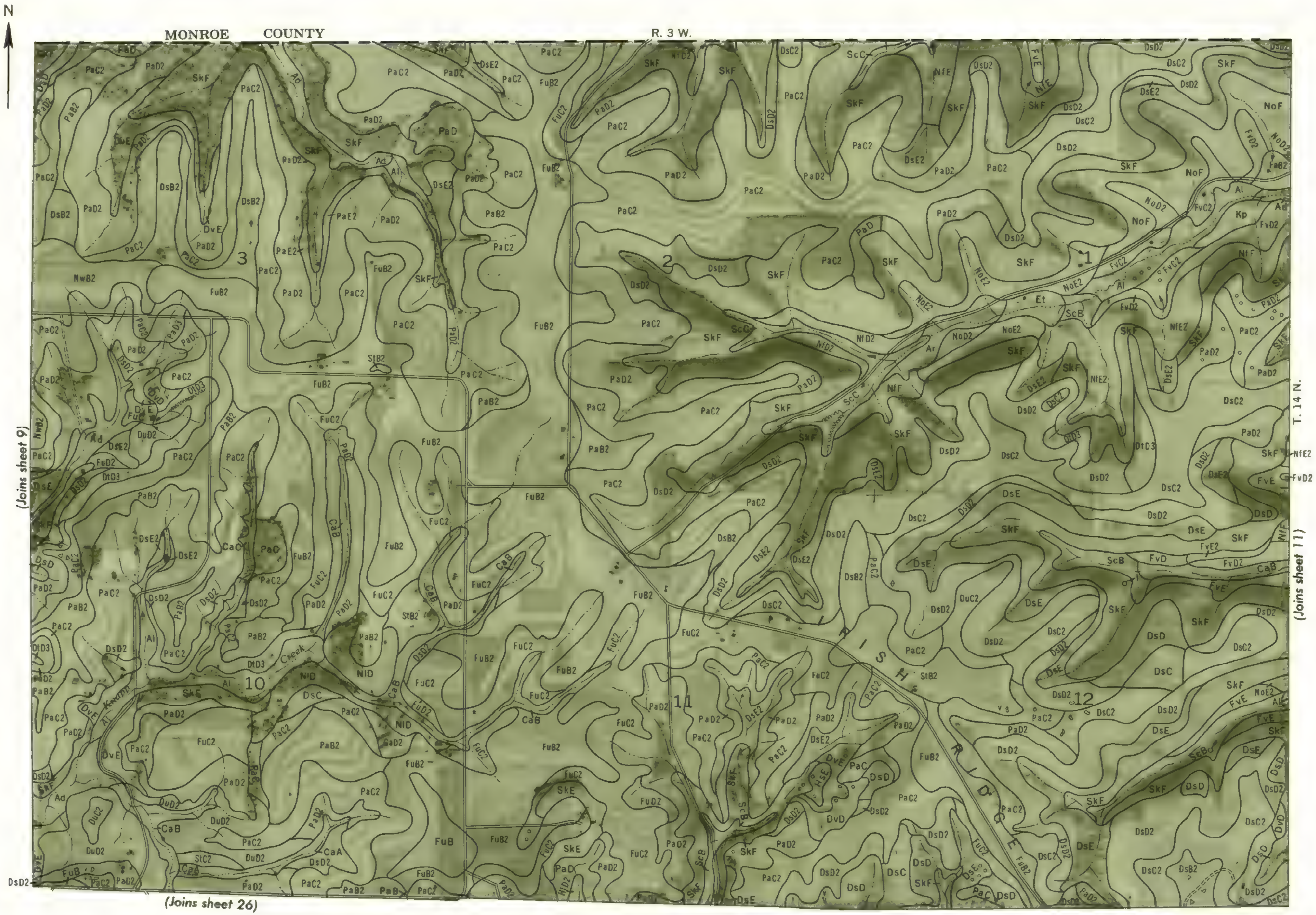
VERNON COUNTY, WISCONSIN — SHEET NUMBER 10

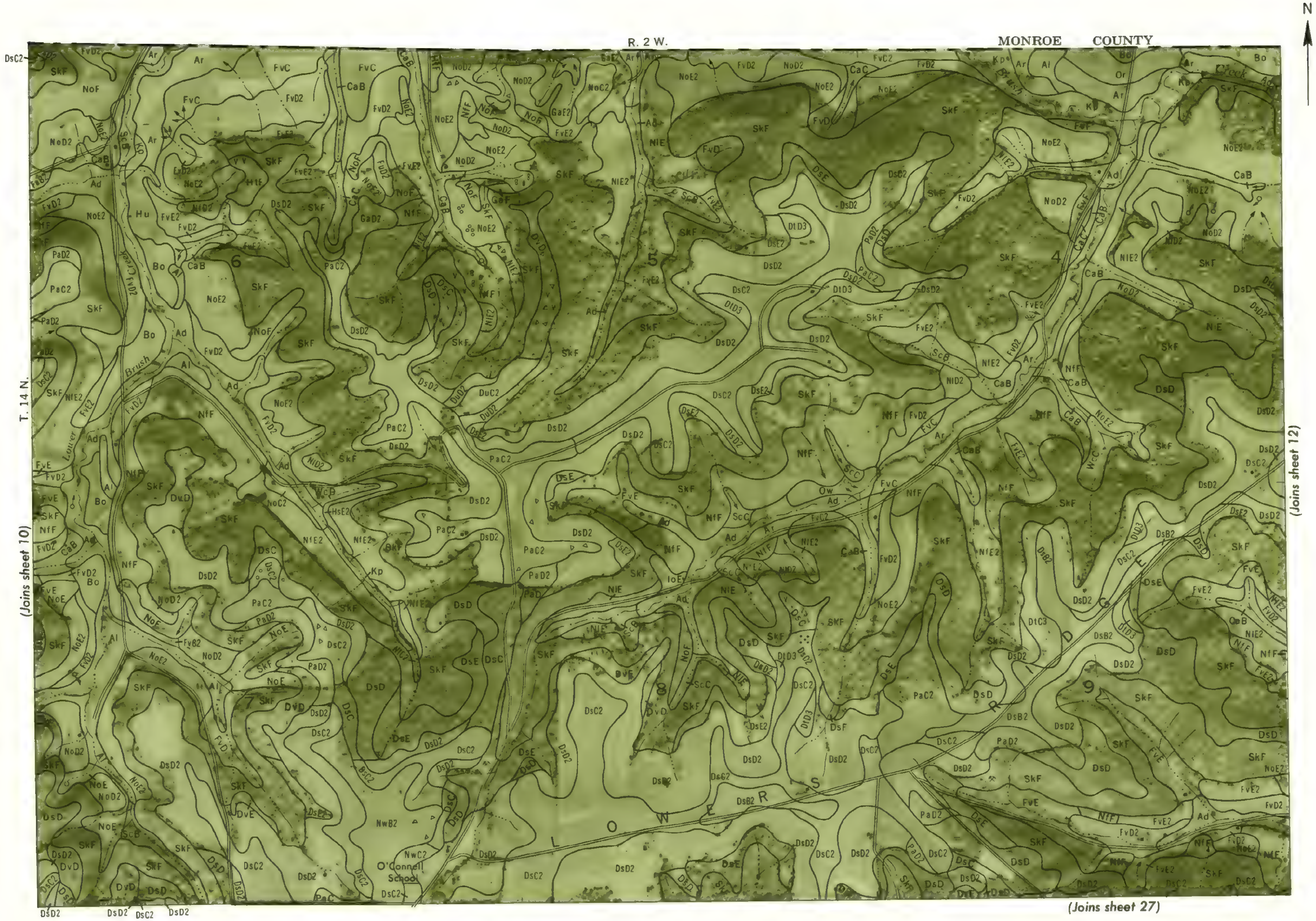


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 10

This map is one of a set of compiled in 1958 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 11

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 12

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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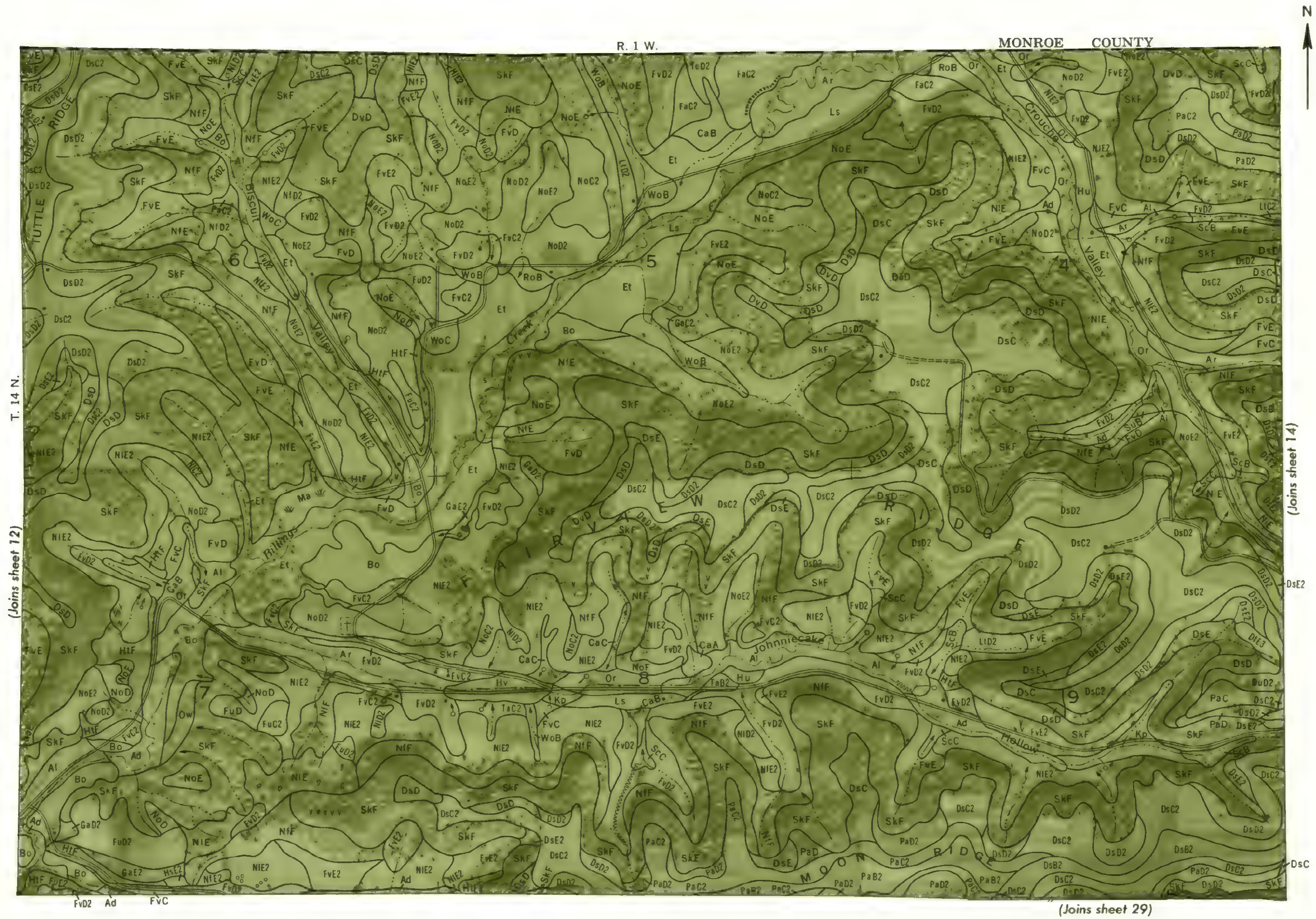
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 13



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VERNON COUNTY, WISCONSIN — SHEET NUMBER 14

VERNON COUNTY, WISCONSIN NO. 14

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

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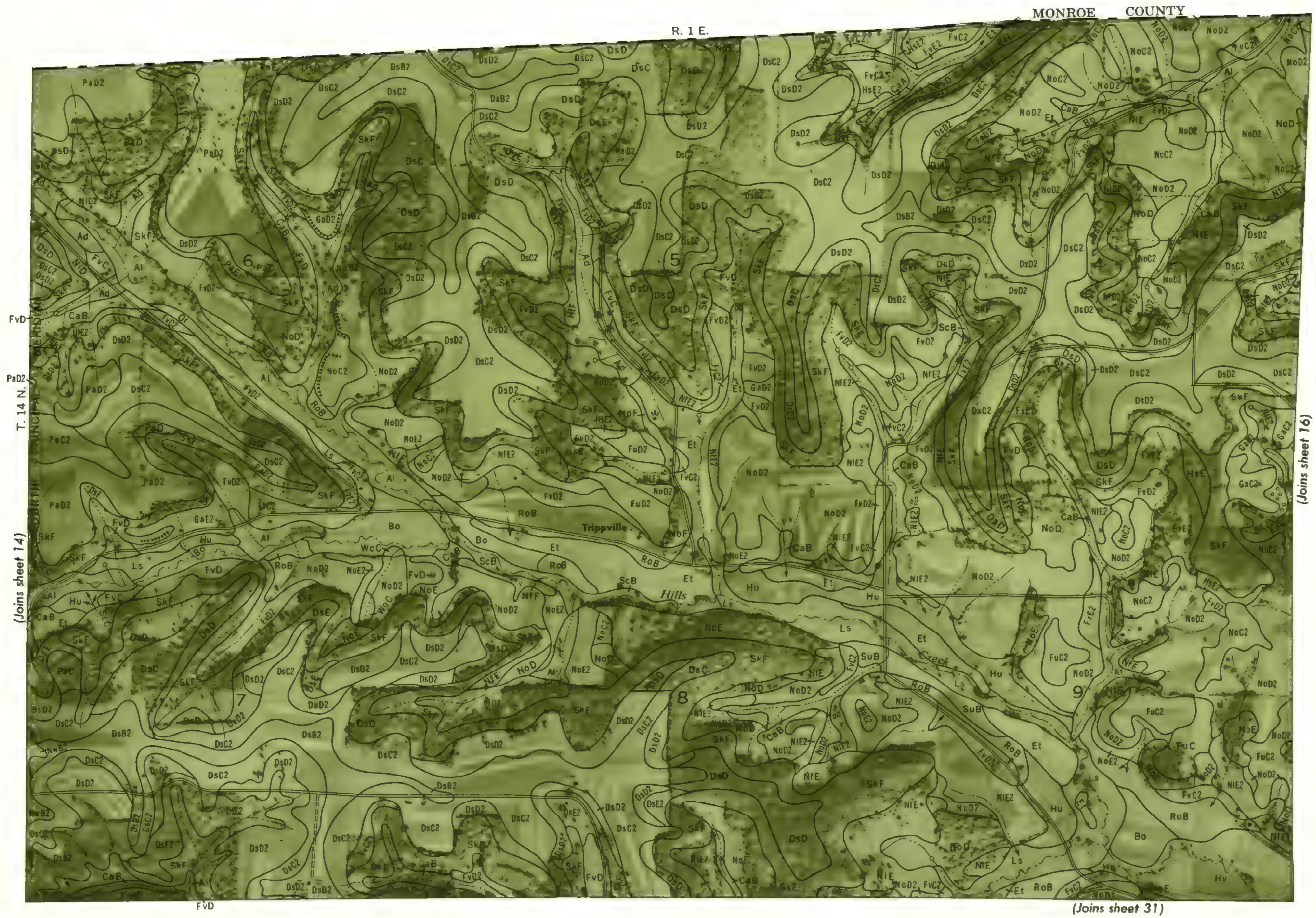
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 15

N



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 16

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 16

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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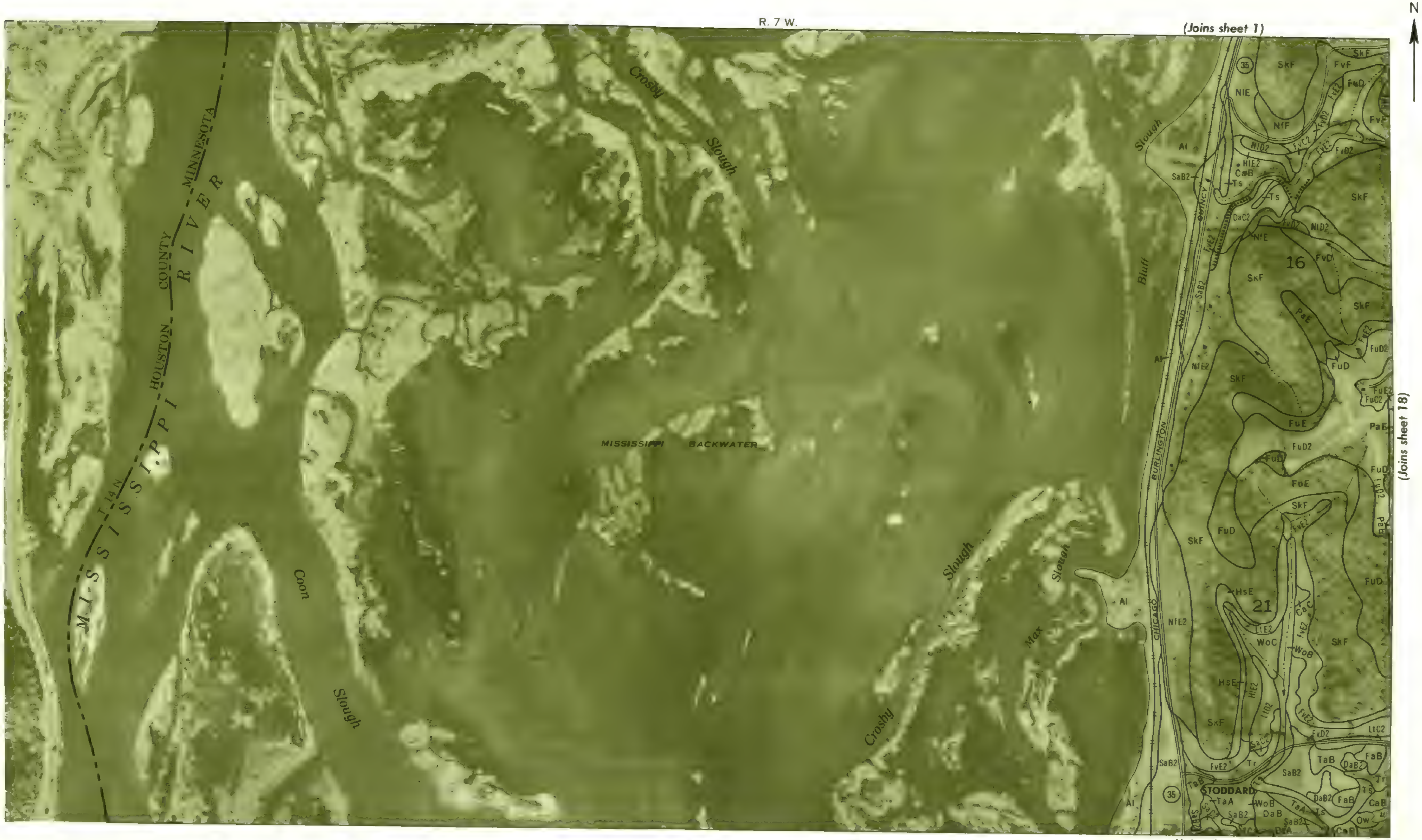
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 17

R. 7 W.

(Joins sheet 1)



(Joins sheet 33)

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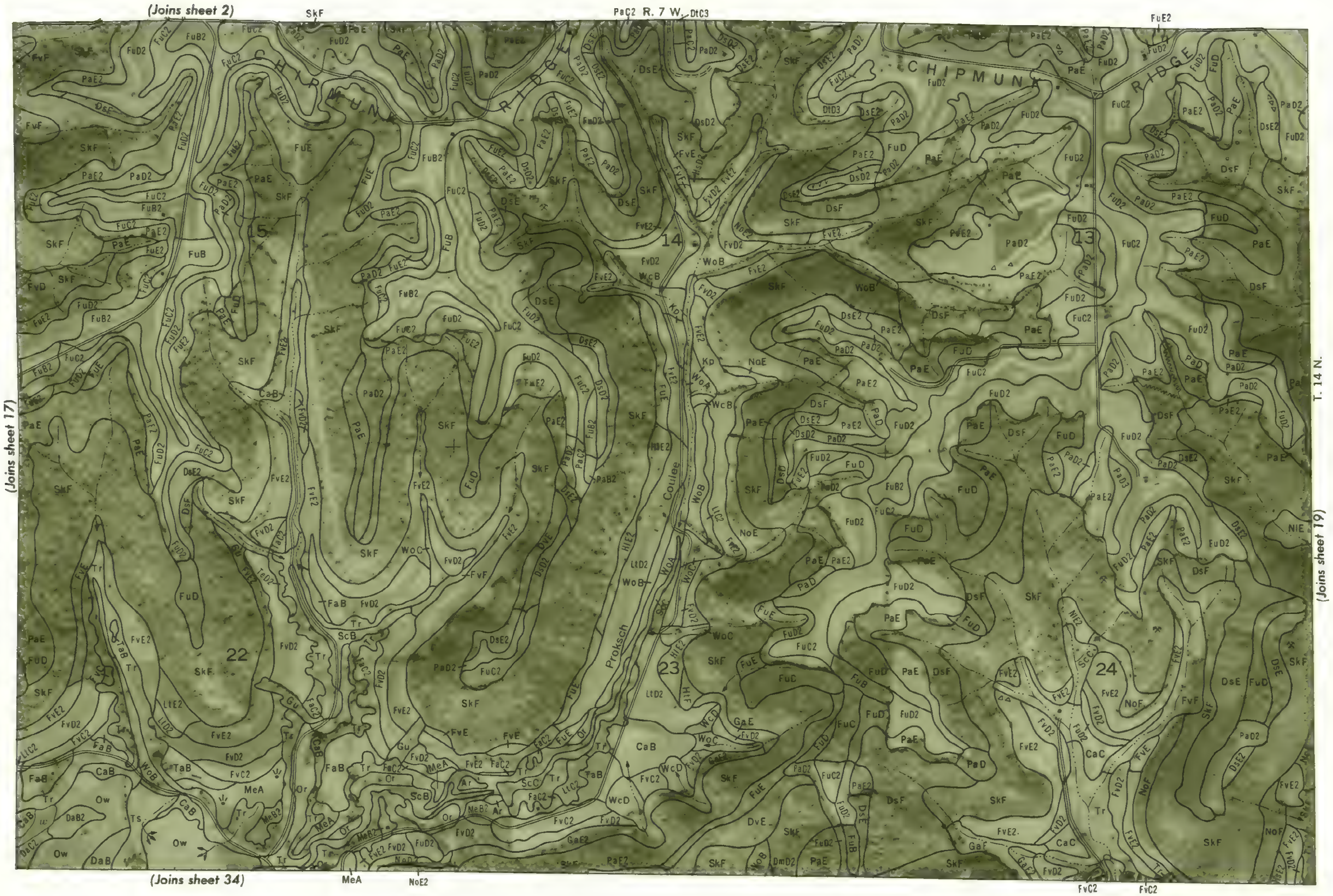

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VERNON COUNTY, WISCONSIN NO. 18

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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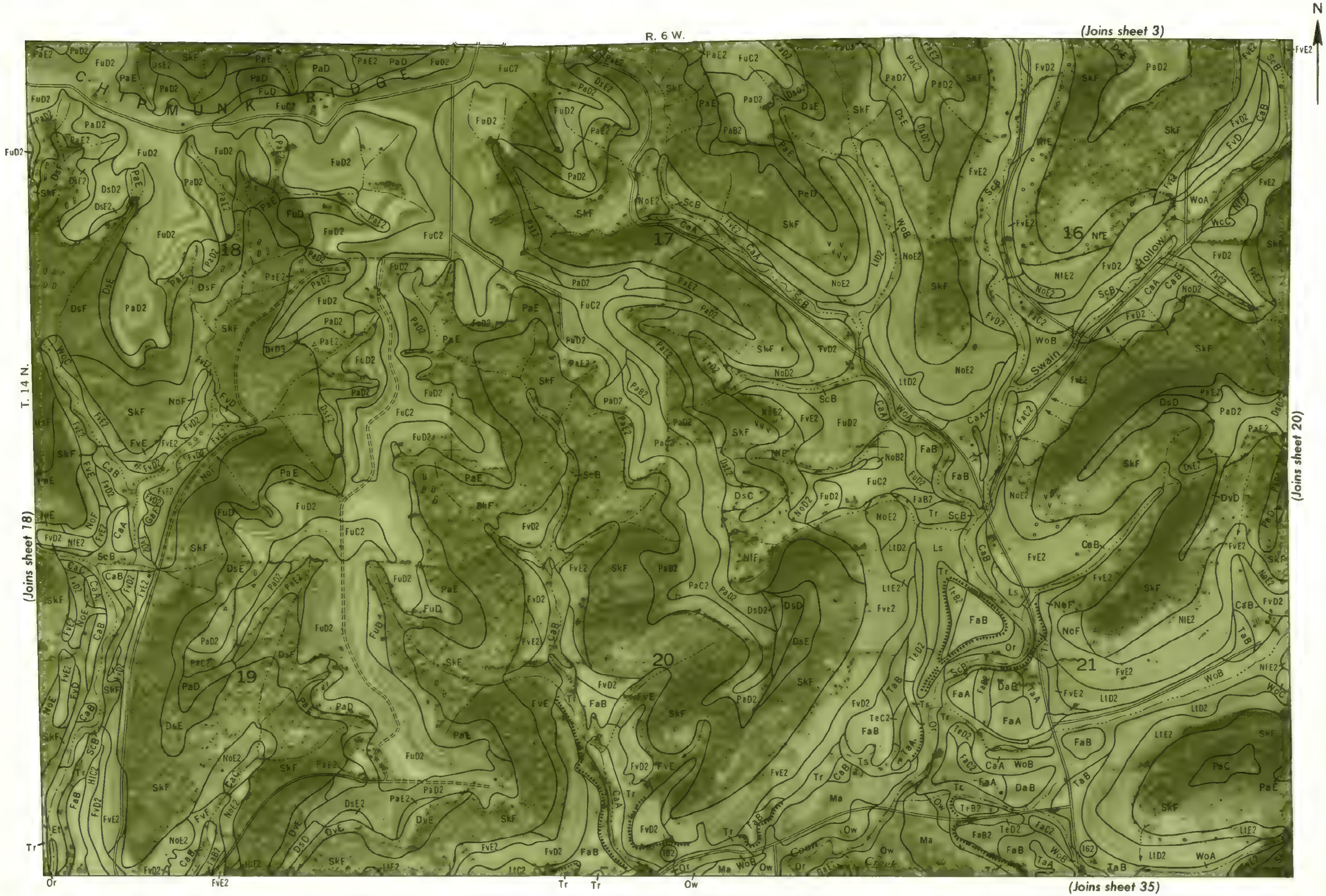
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 19



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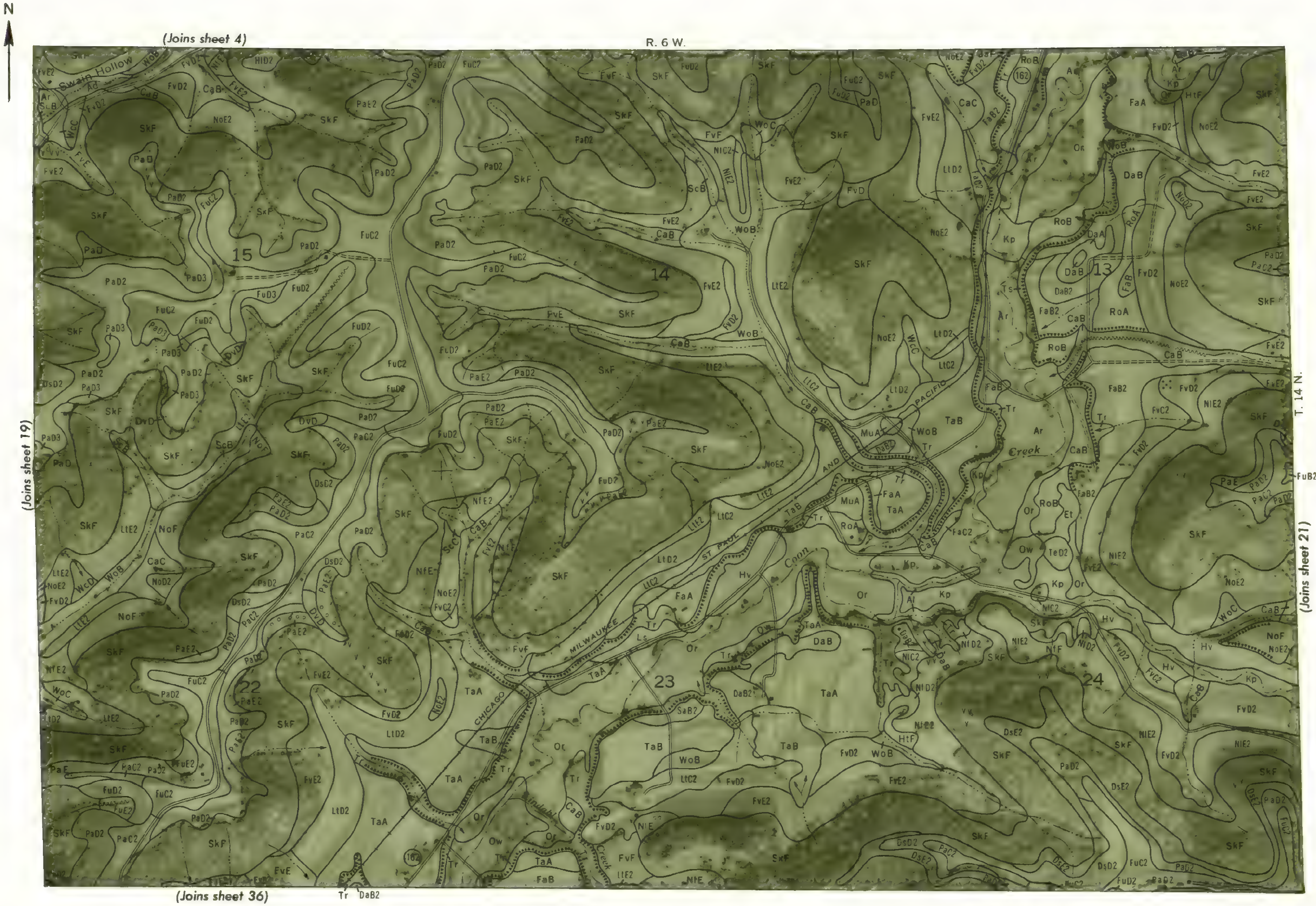
20



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VERNON COUNTY, WISCONSIN NO. 20

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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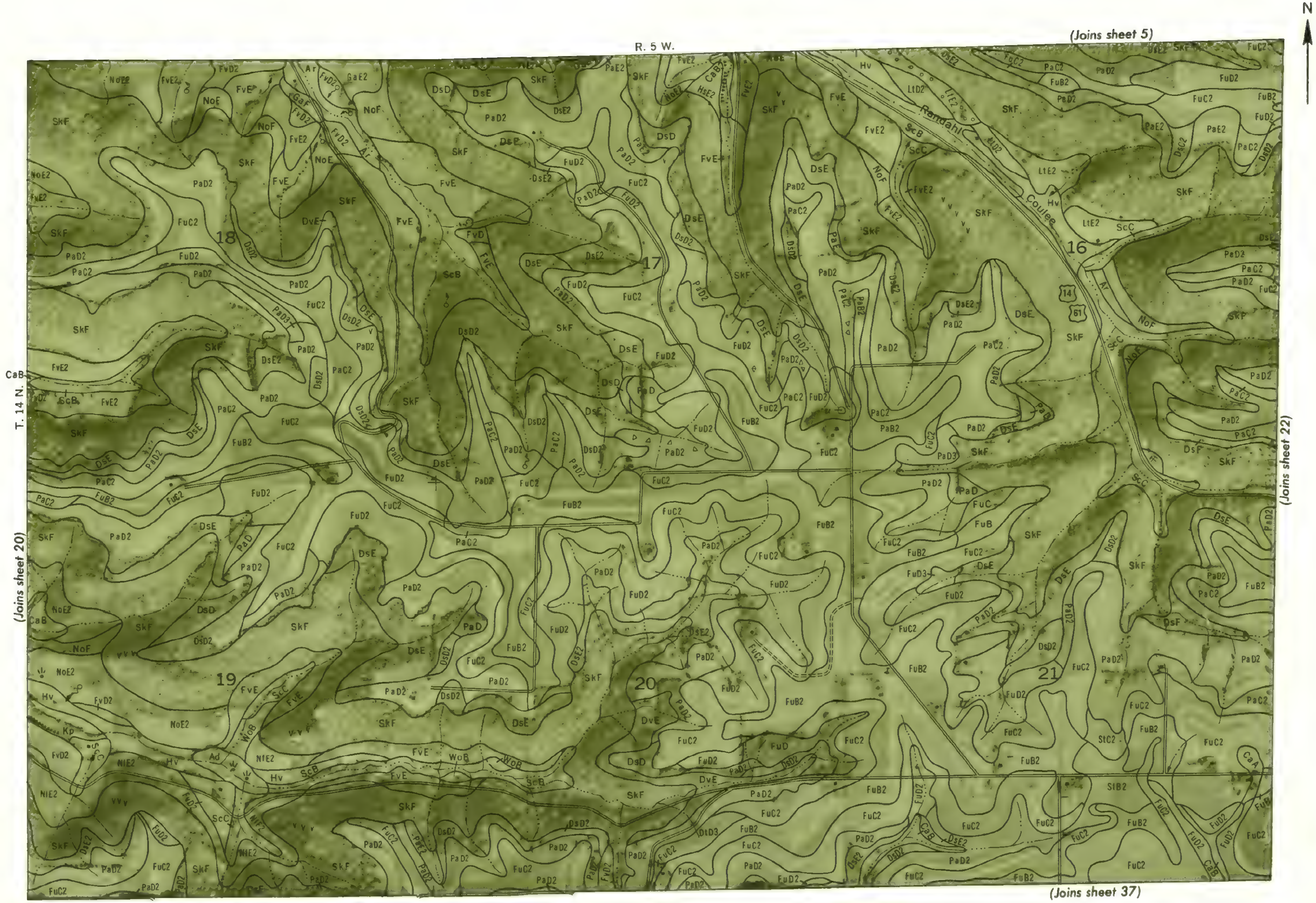

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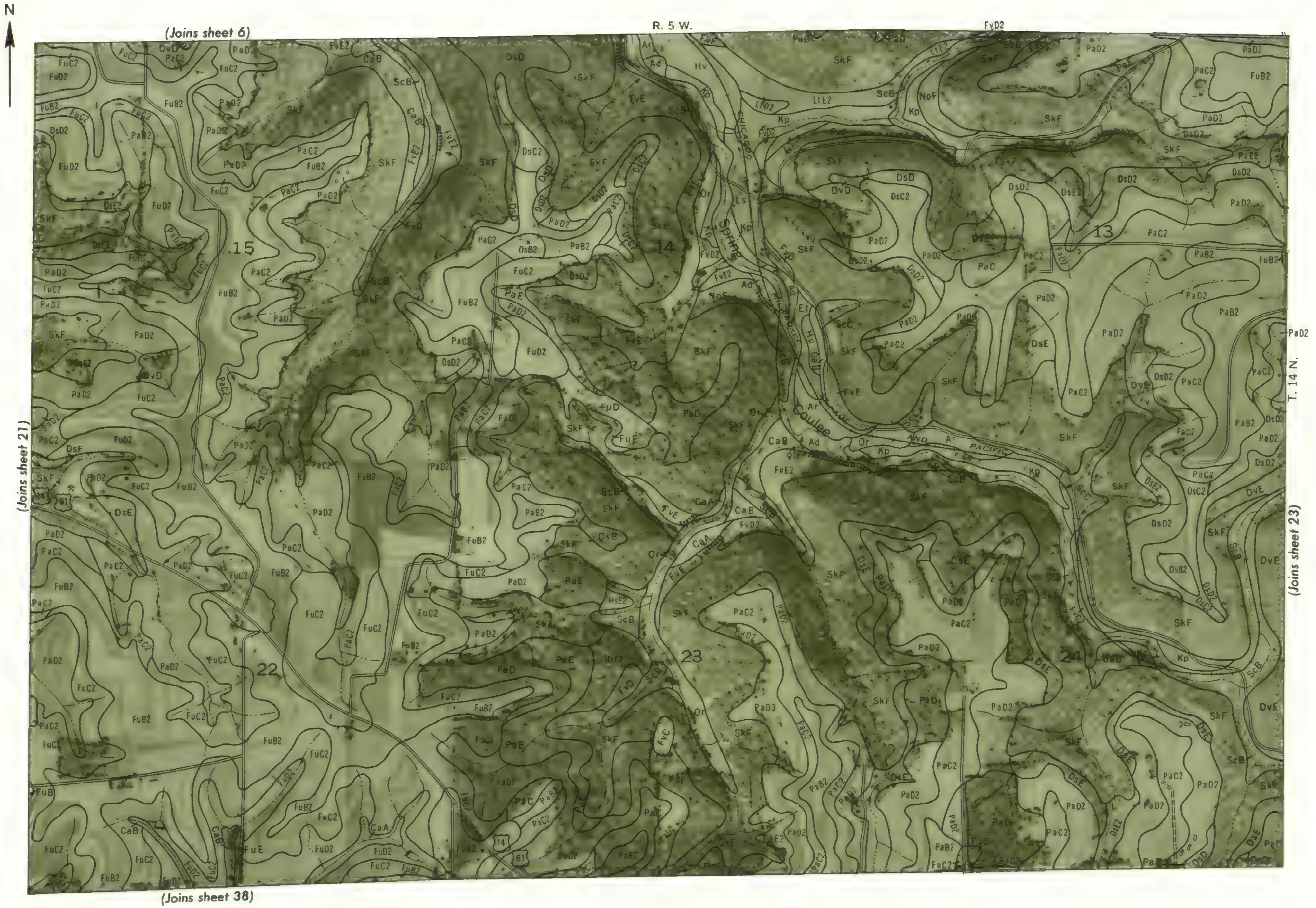
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 21

22



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VERNON COUNTY, WISCONSIN NO. 22

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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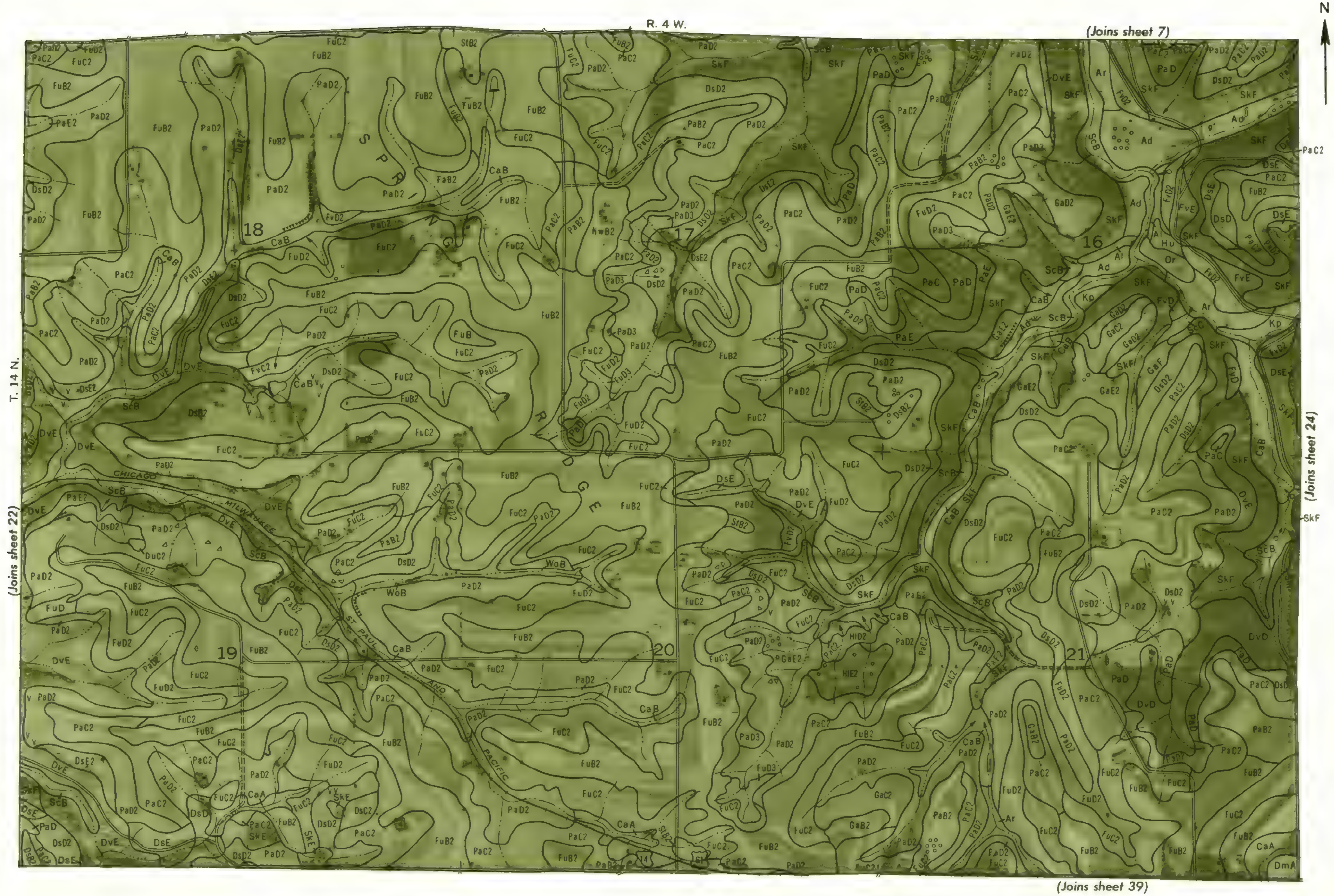
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 23



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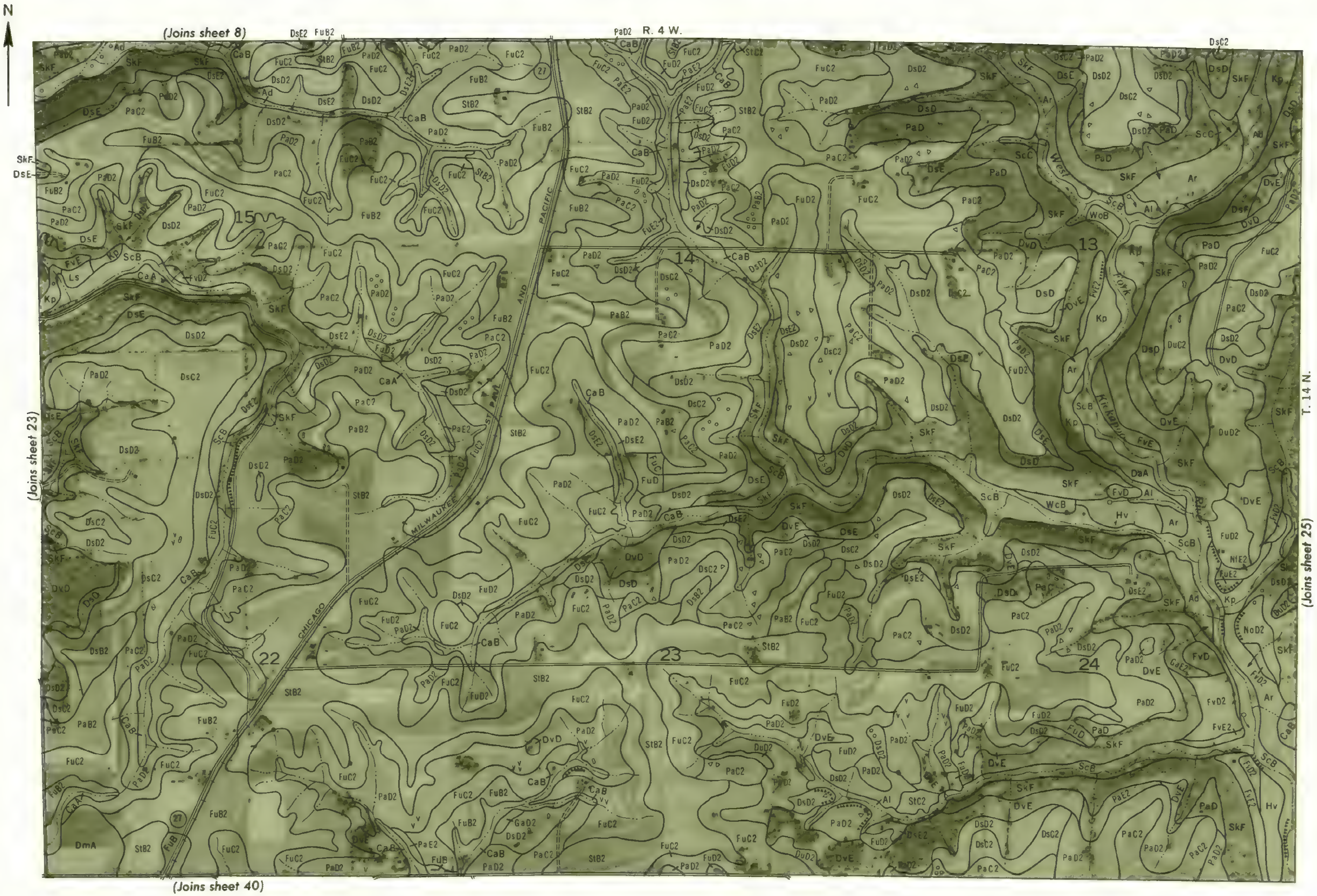
VERNON COUNTY, WISCONSIN — SHEET NUMBER 24



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VERNON COUNTY, WISCONSIN NO. 24

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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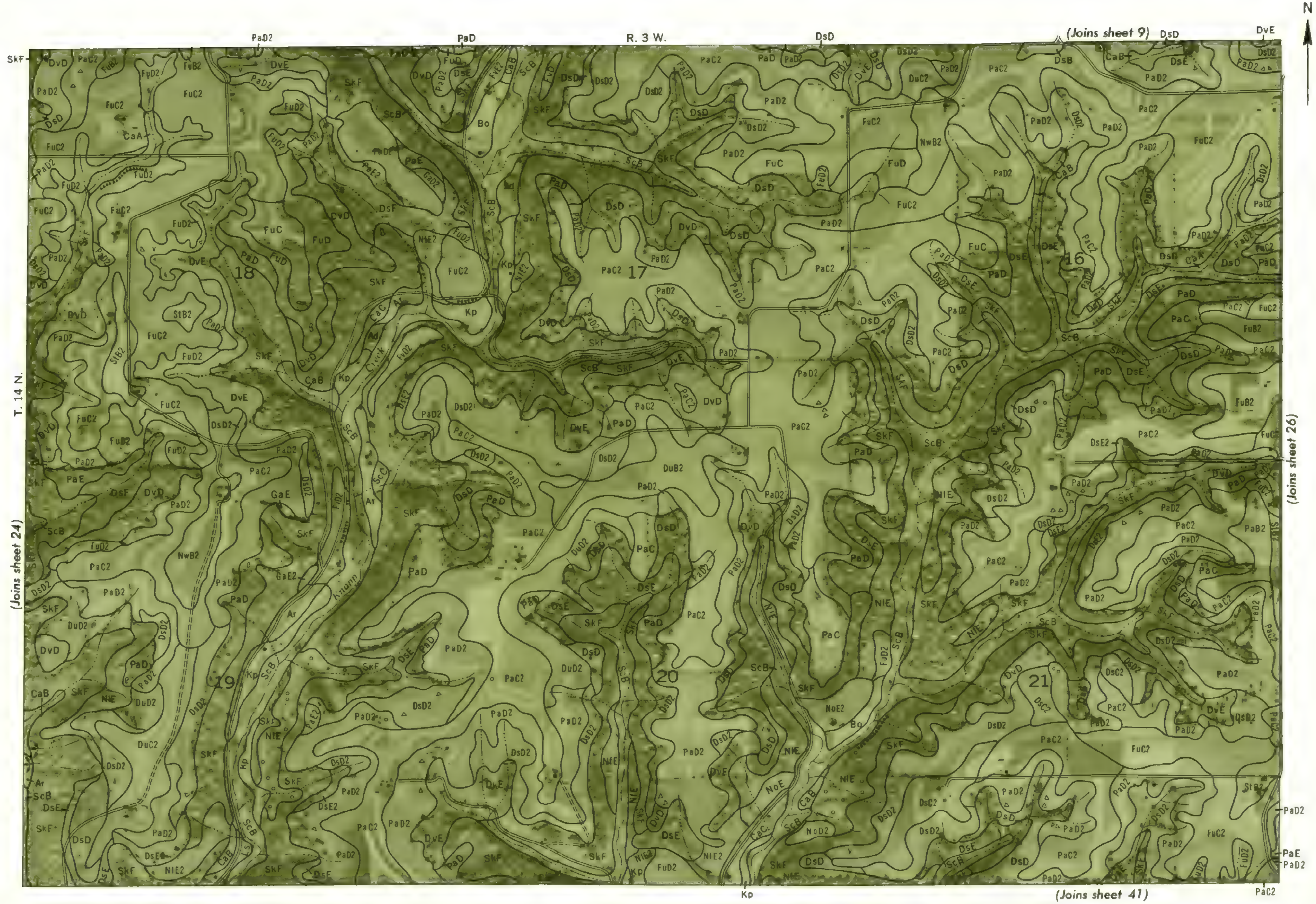
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 25



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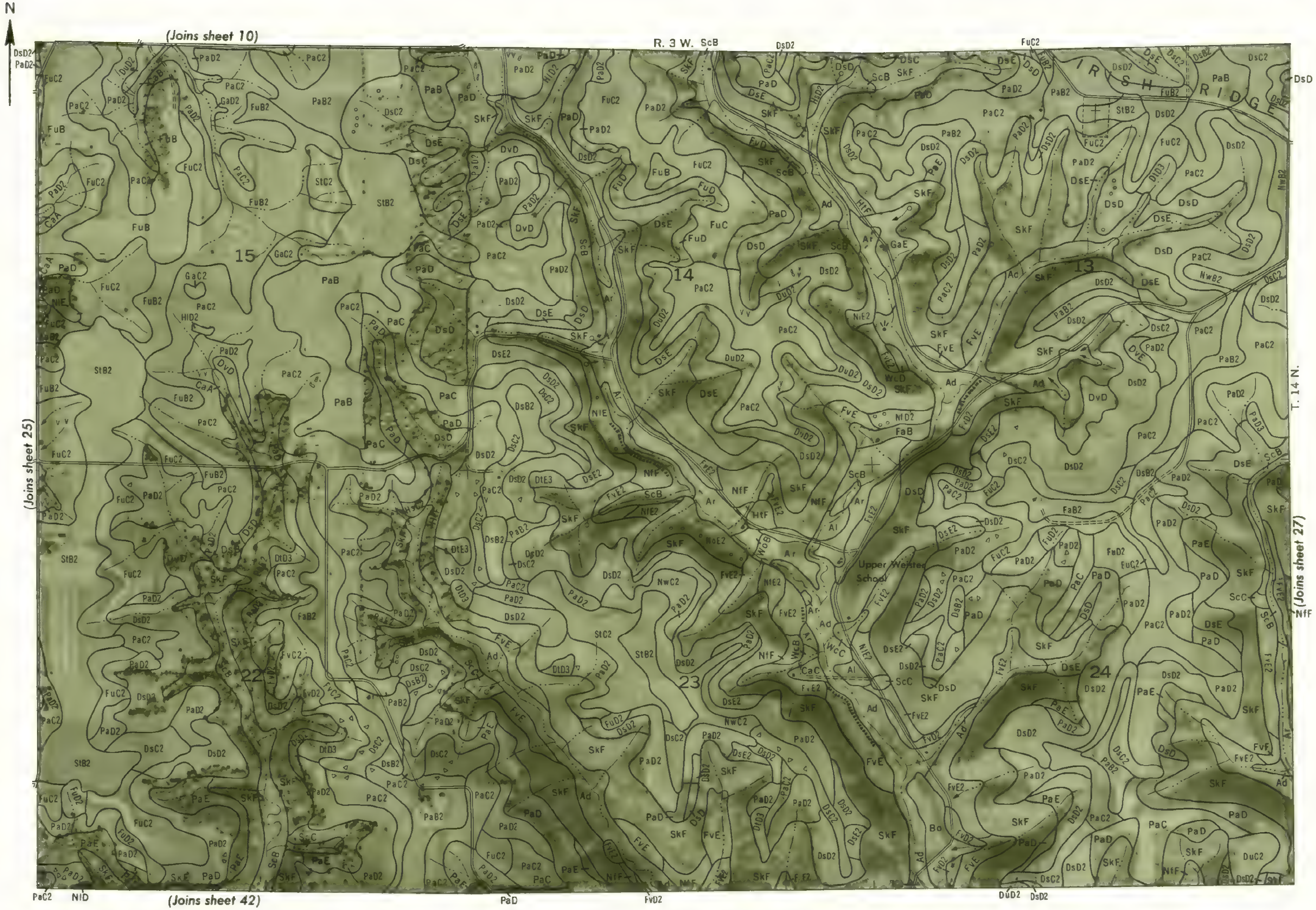
VERNON COUNTY, WISCONSIN — SHEET NUMBER 26



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VERNON COUNTY, WISCONSIN NO. 26

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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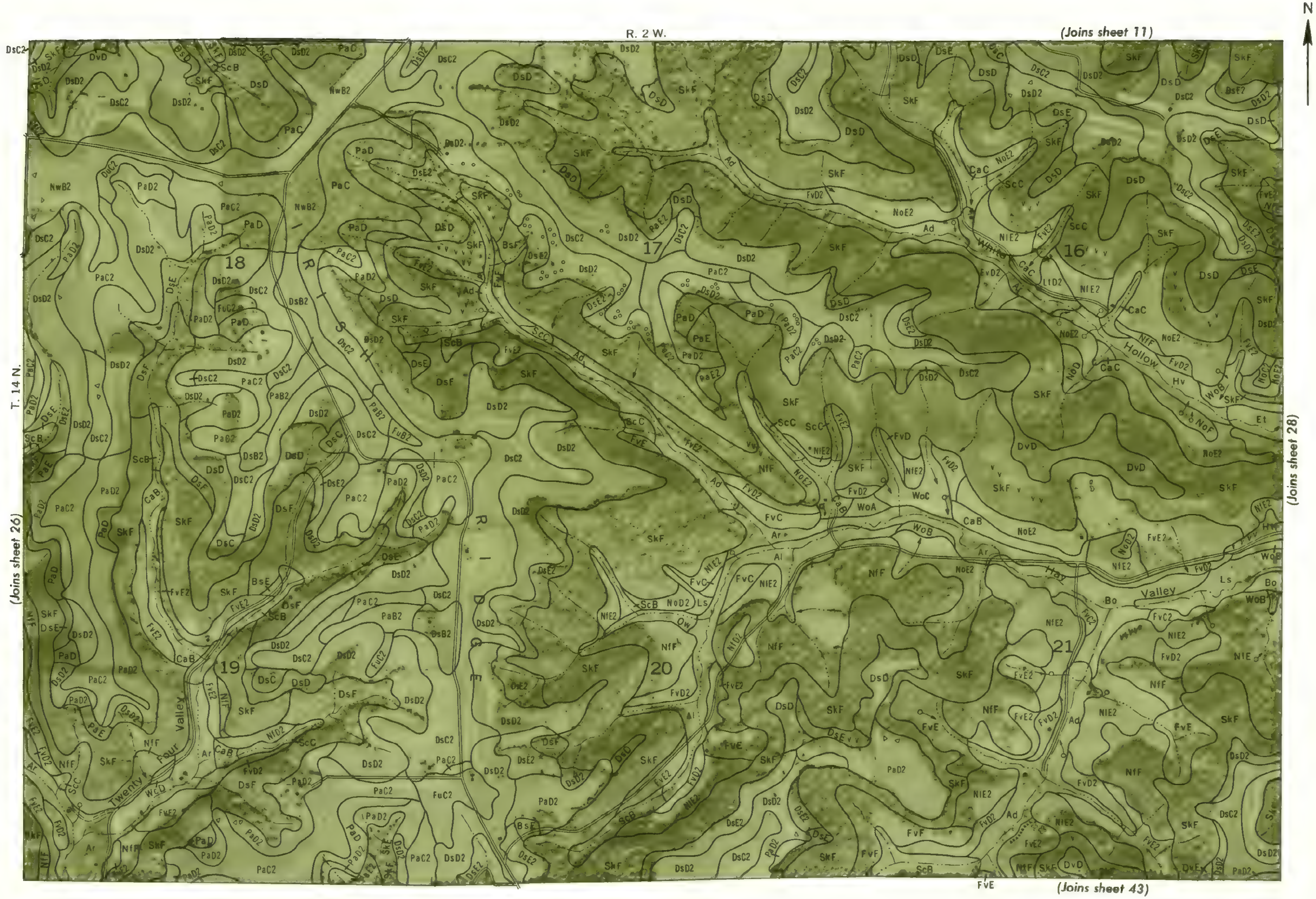
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 27



0 ½ Mile Scale 1:15840 0 3000 Feet

(28)

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 28

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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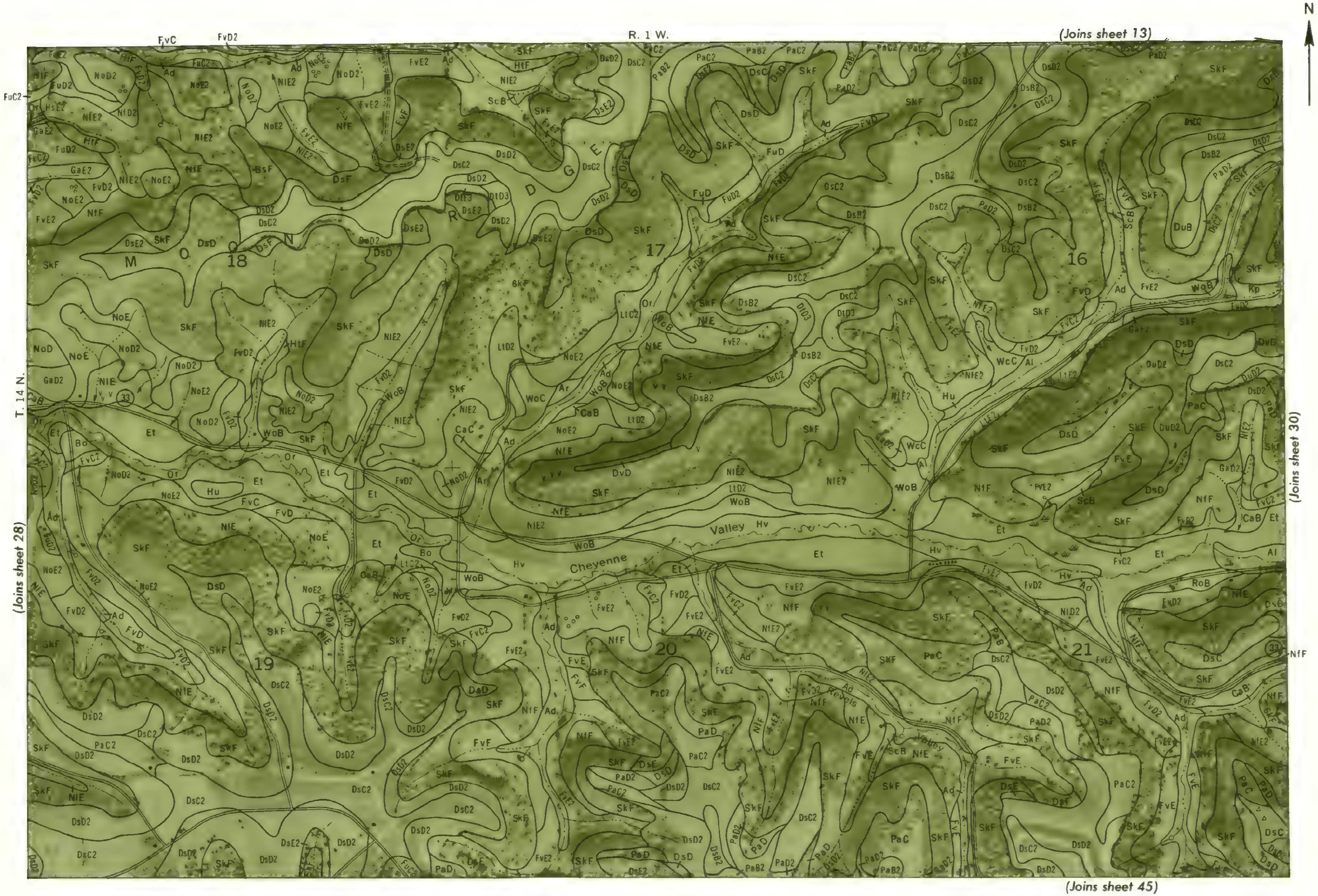

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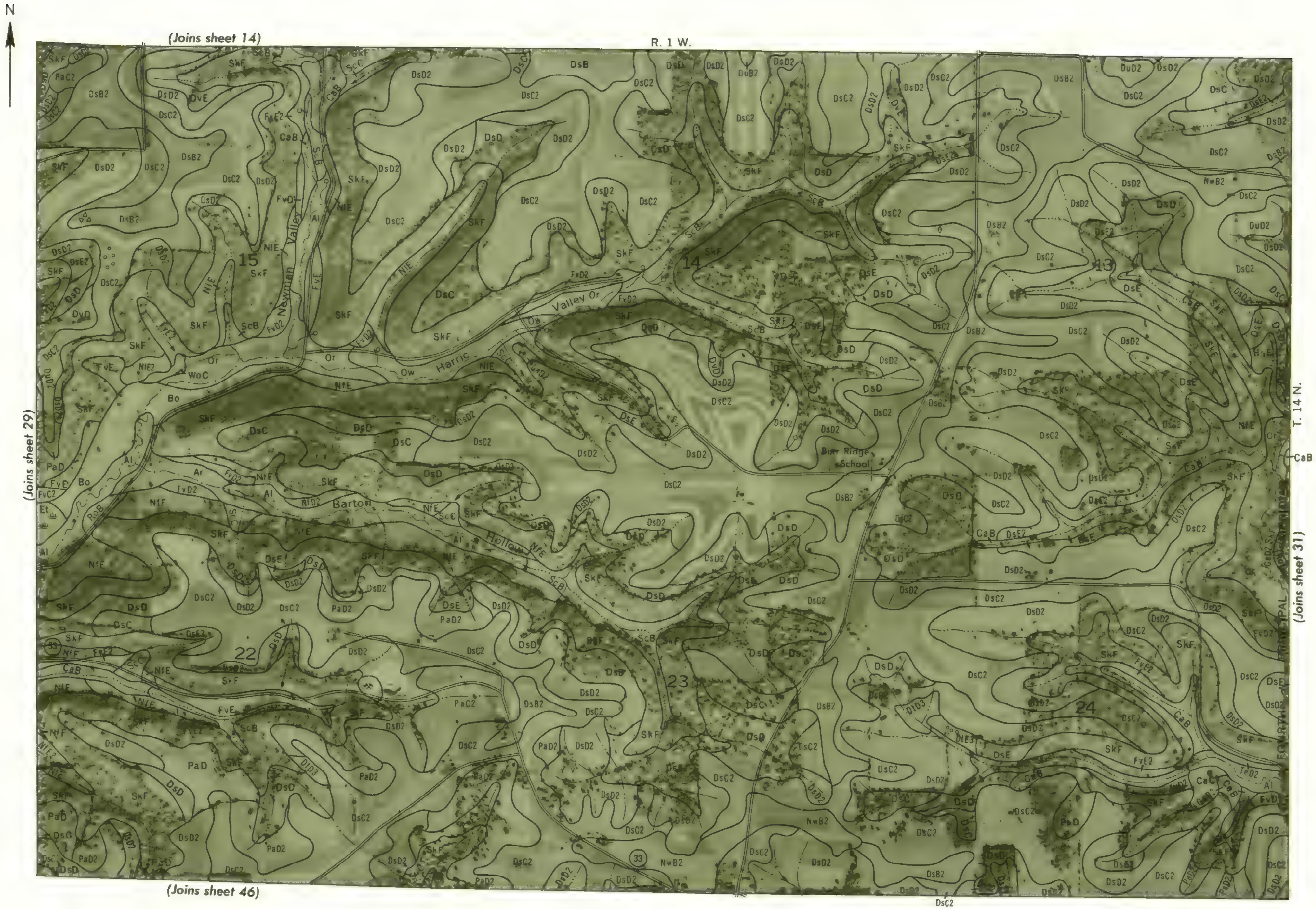

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VERNON COUNTY, WISCONSIN NO. 30

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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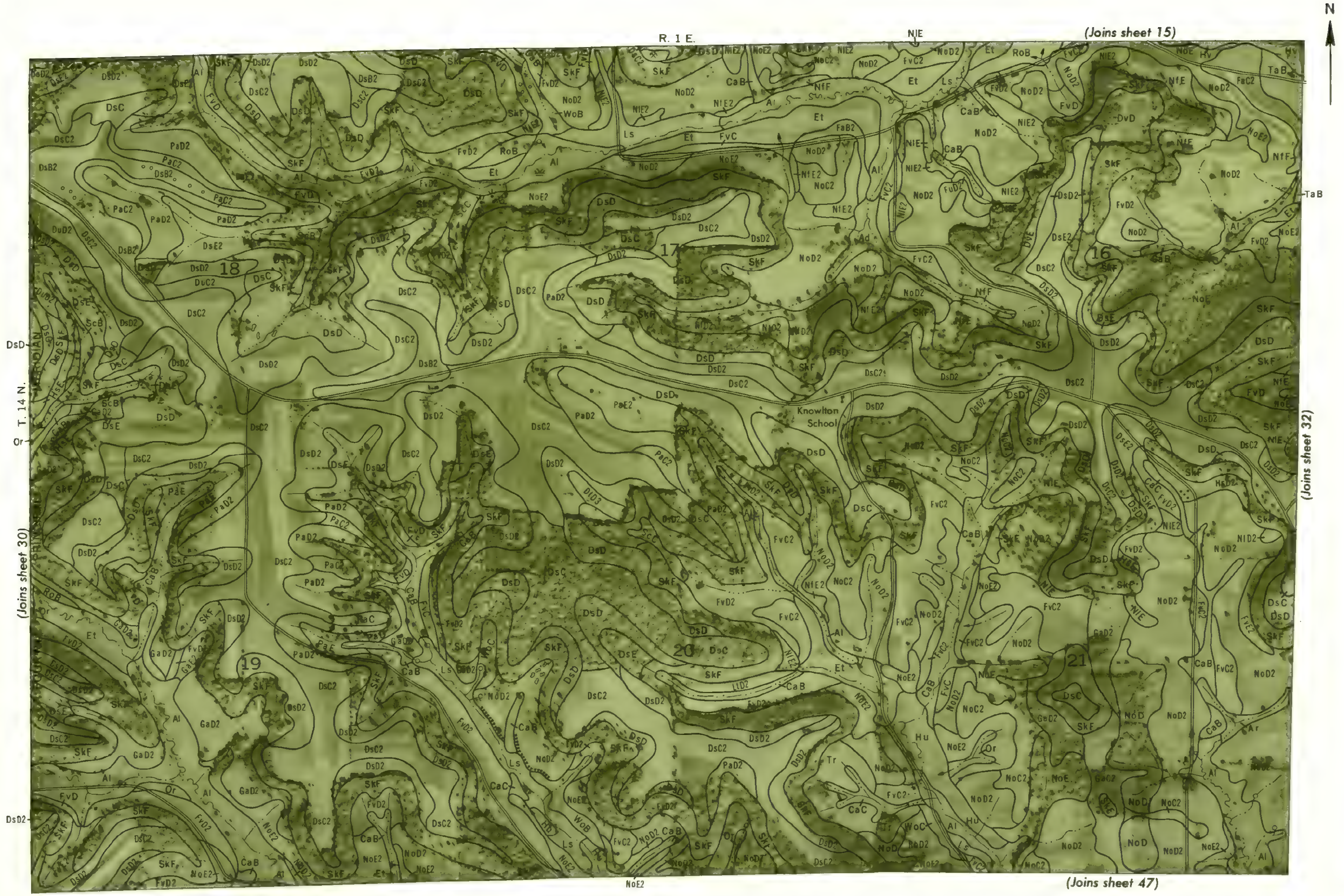

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Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 31

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 32

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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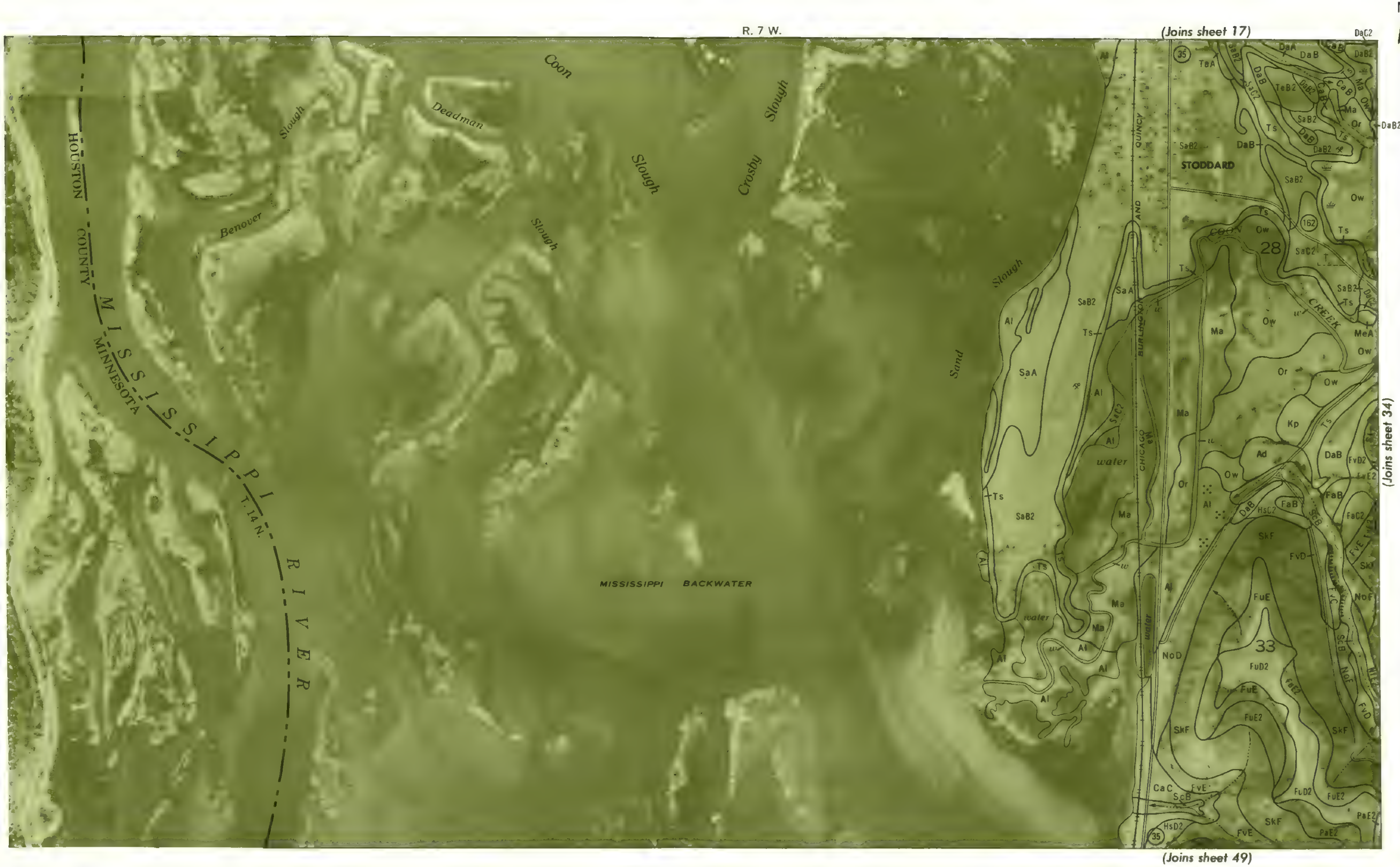

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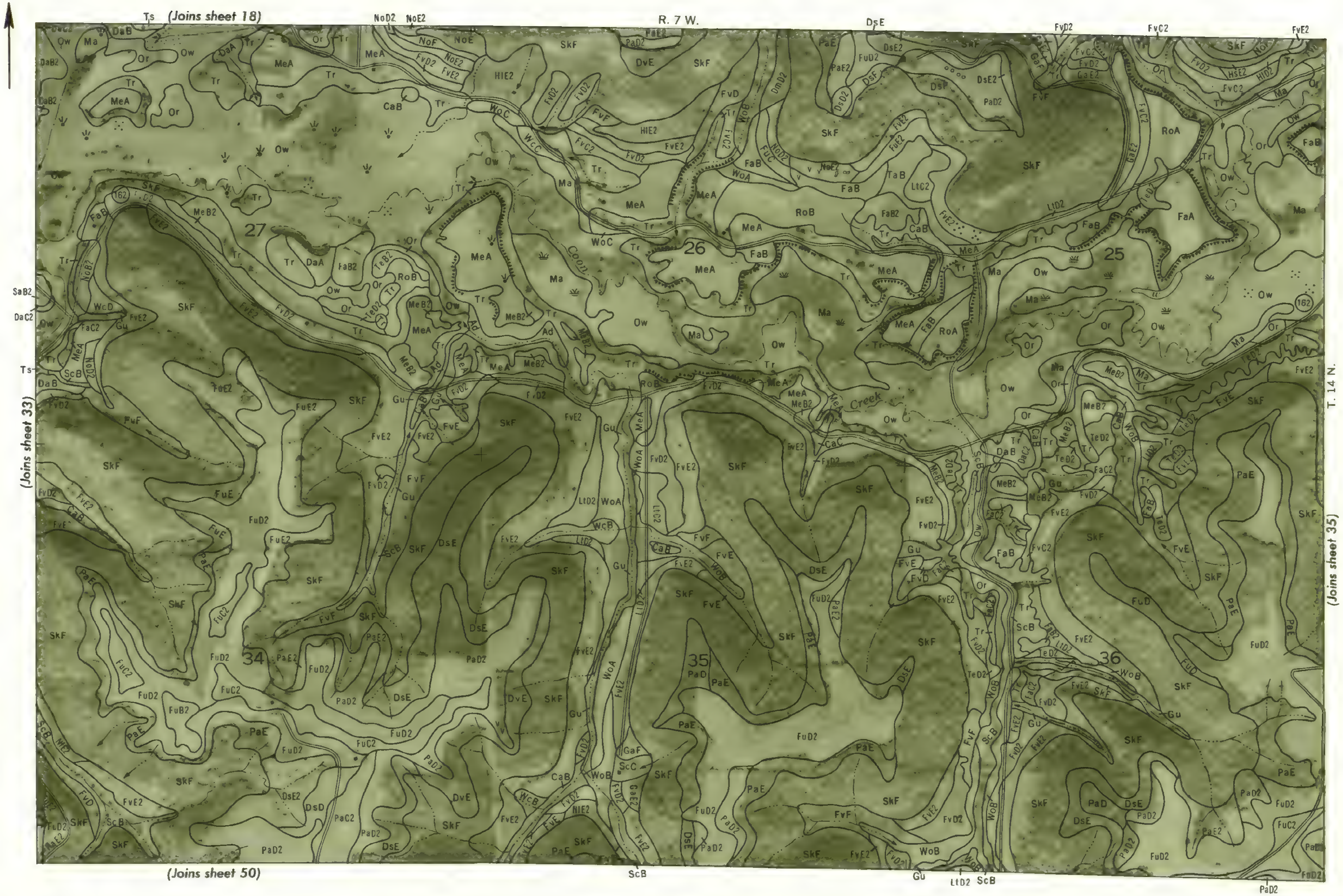
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 33

VERNON COUNTY, WISCONSIN — SHEET NUMBER 34

N



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VERNON COUNTY, WISCONSIN NO. 34

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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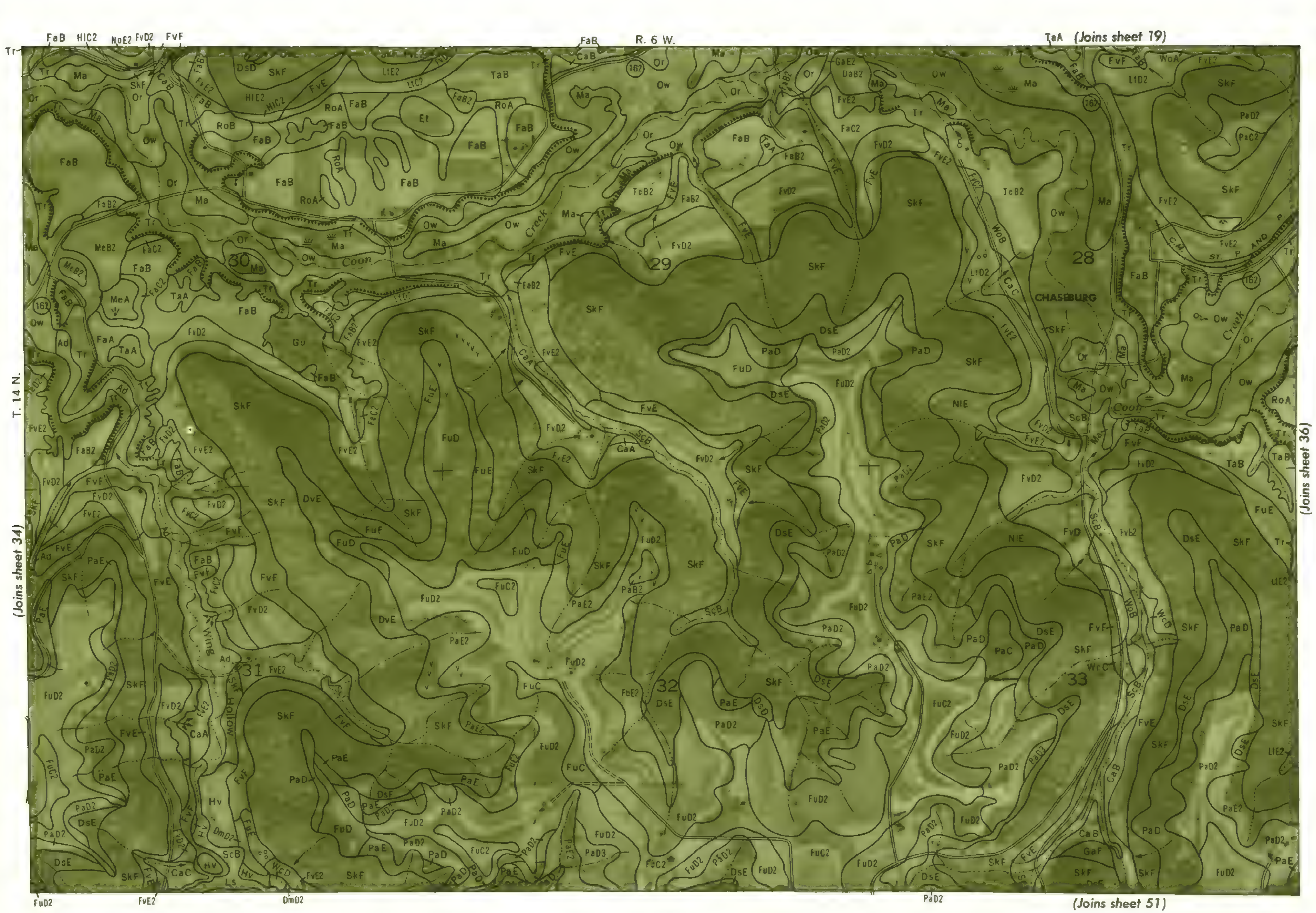
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 35



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VERNON COUNTY, WISCONSIN — SHEET NUMBER 36

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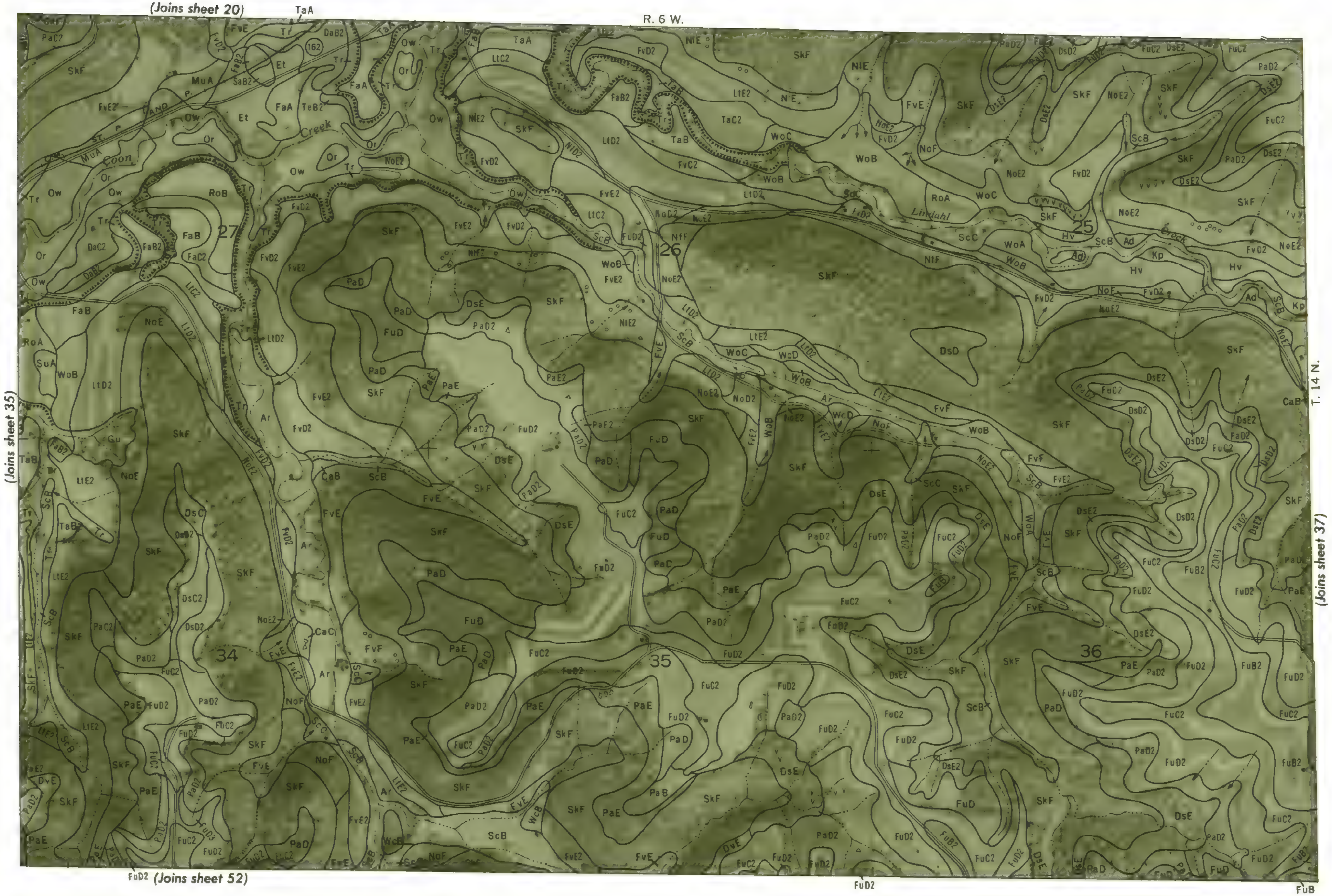

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VERNON COUNTY, WISCONSIN NO. 36

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 37

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 38

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 38

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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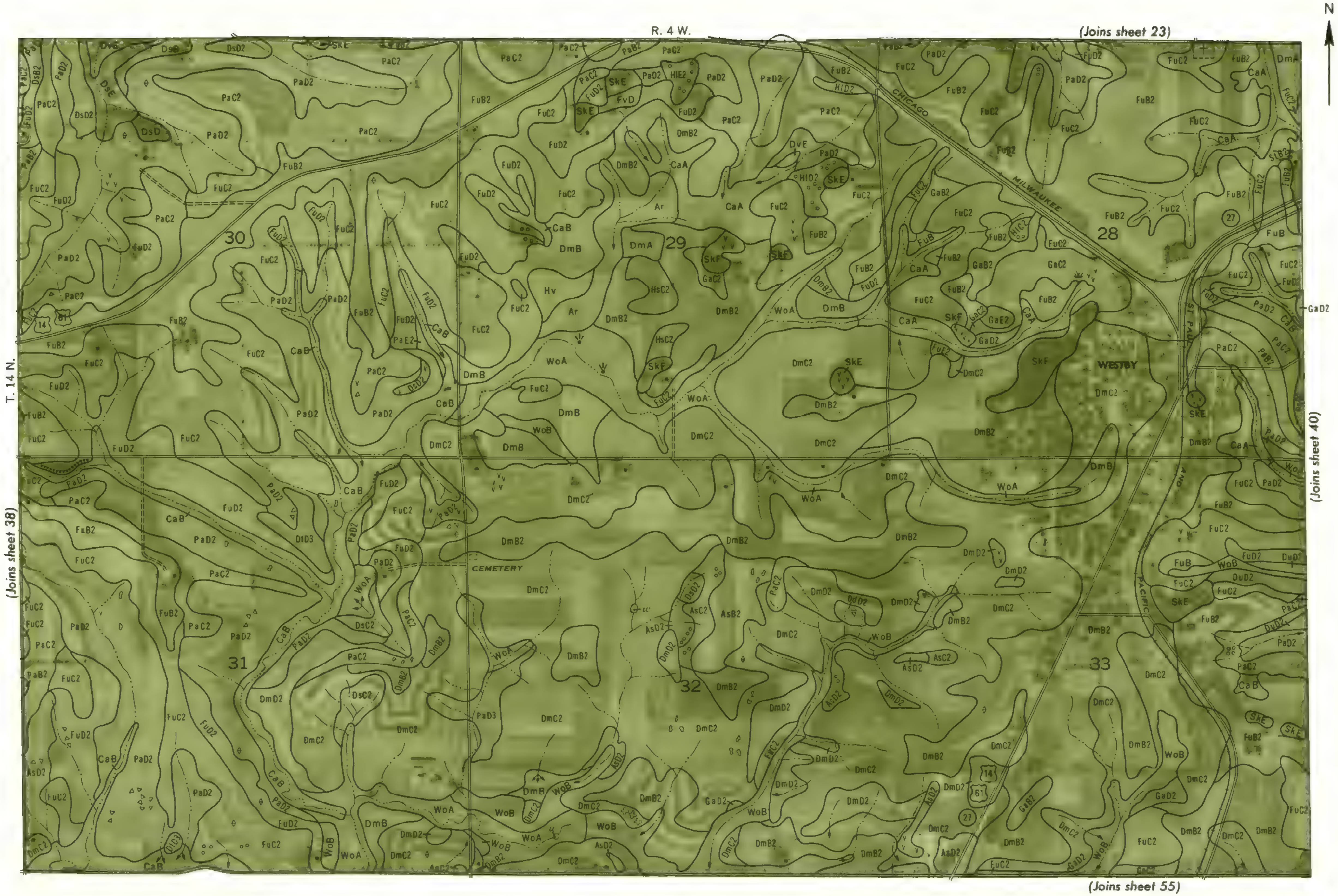
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 39



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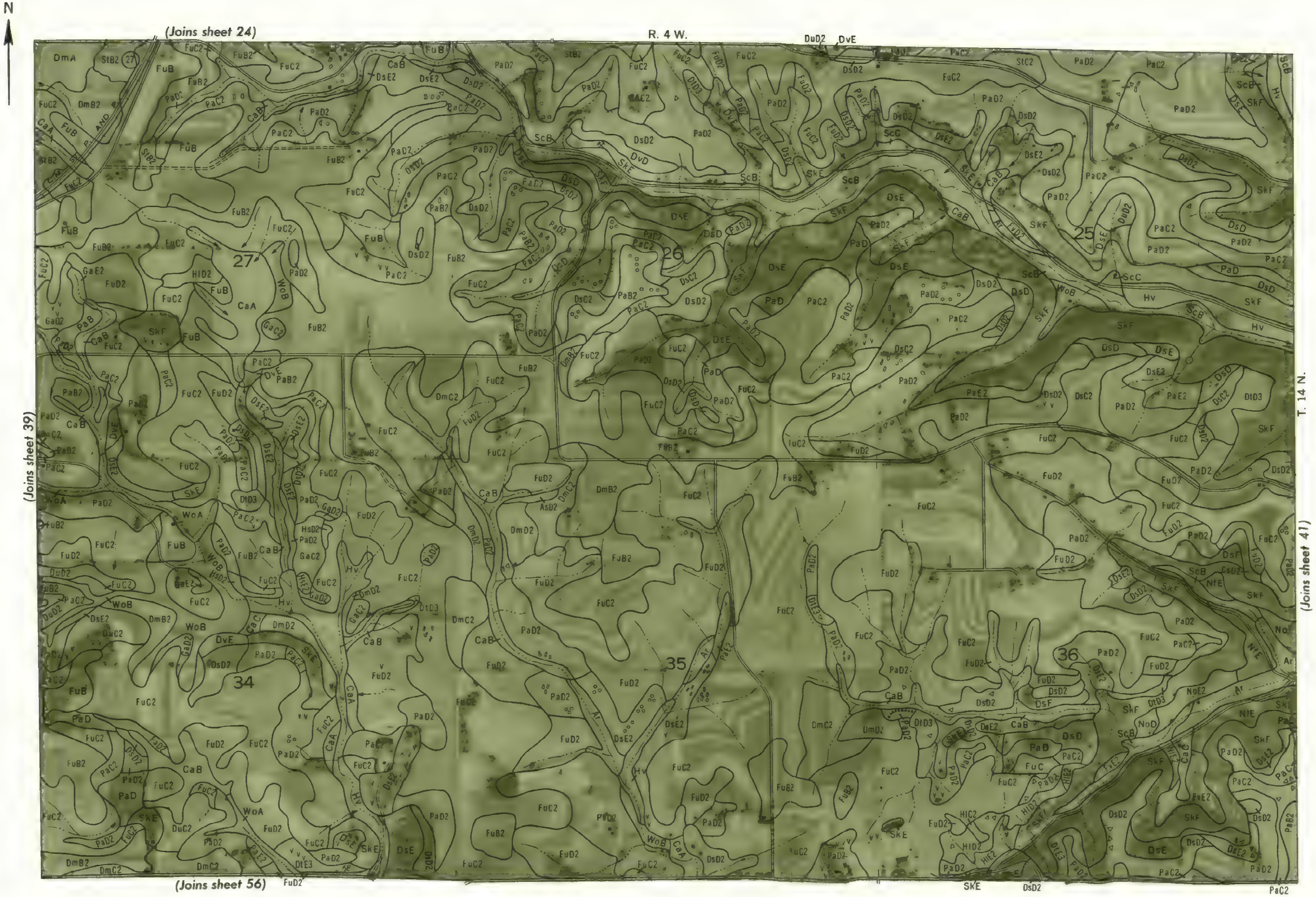
VERNON COUNTY, WISCONSIN — SHEET NUMBER 40



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VERNON COUNTY, WISCONSIN NO. 40

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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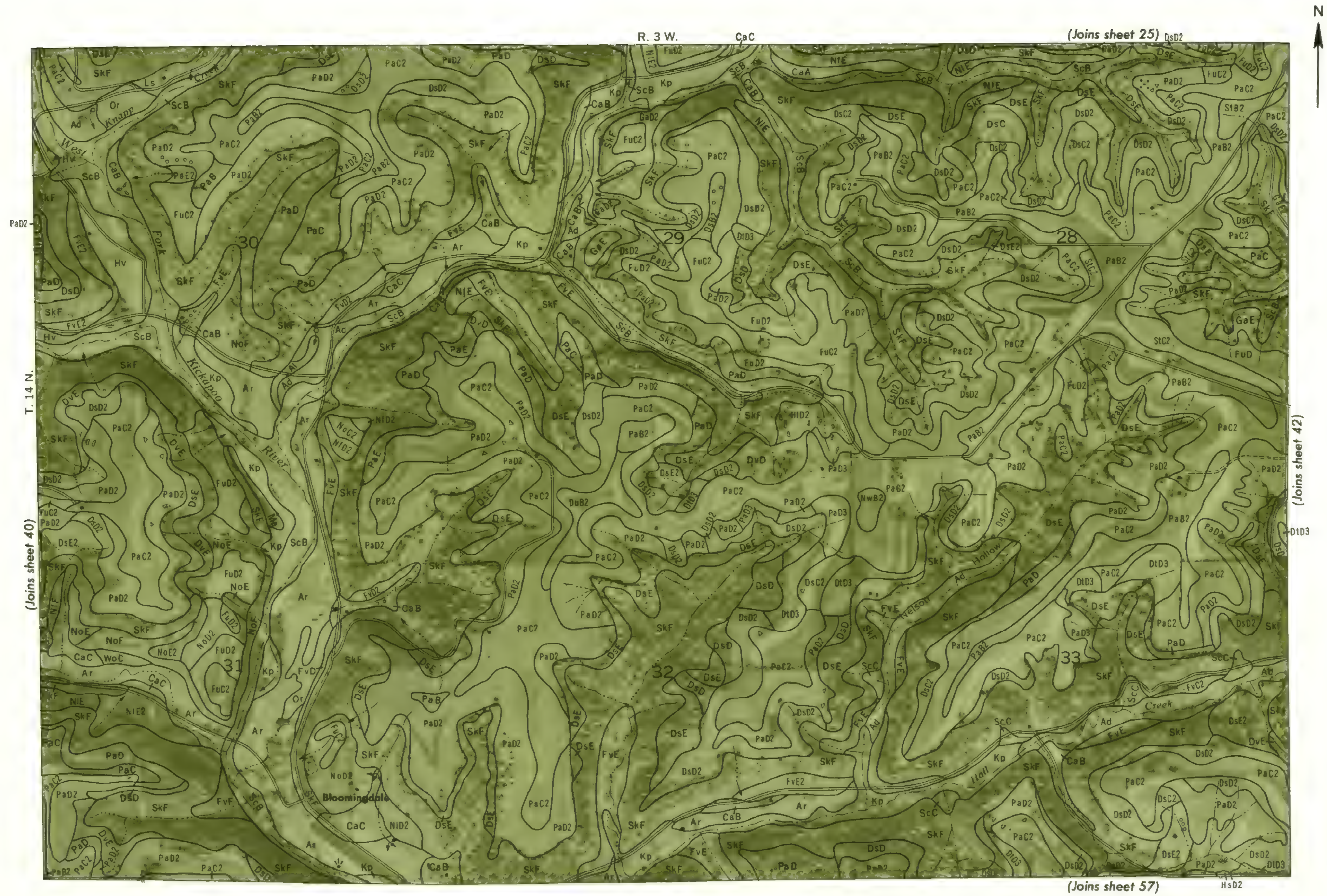

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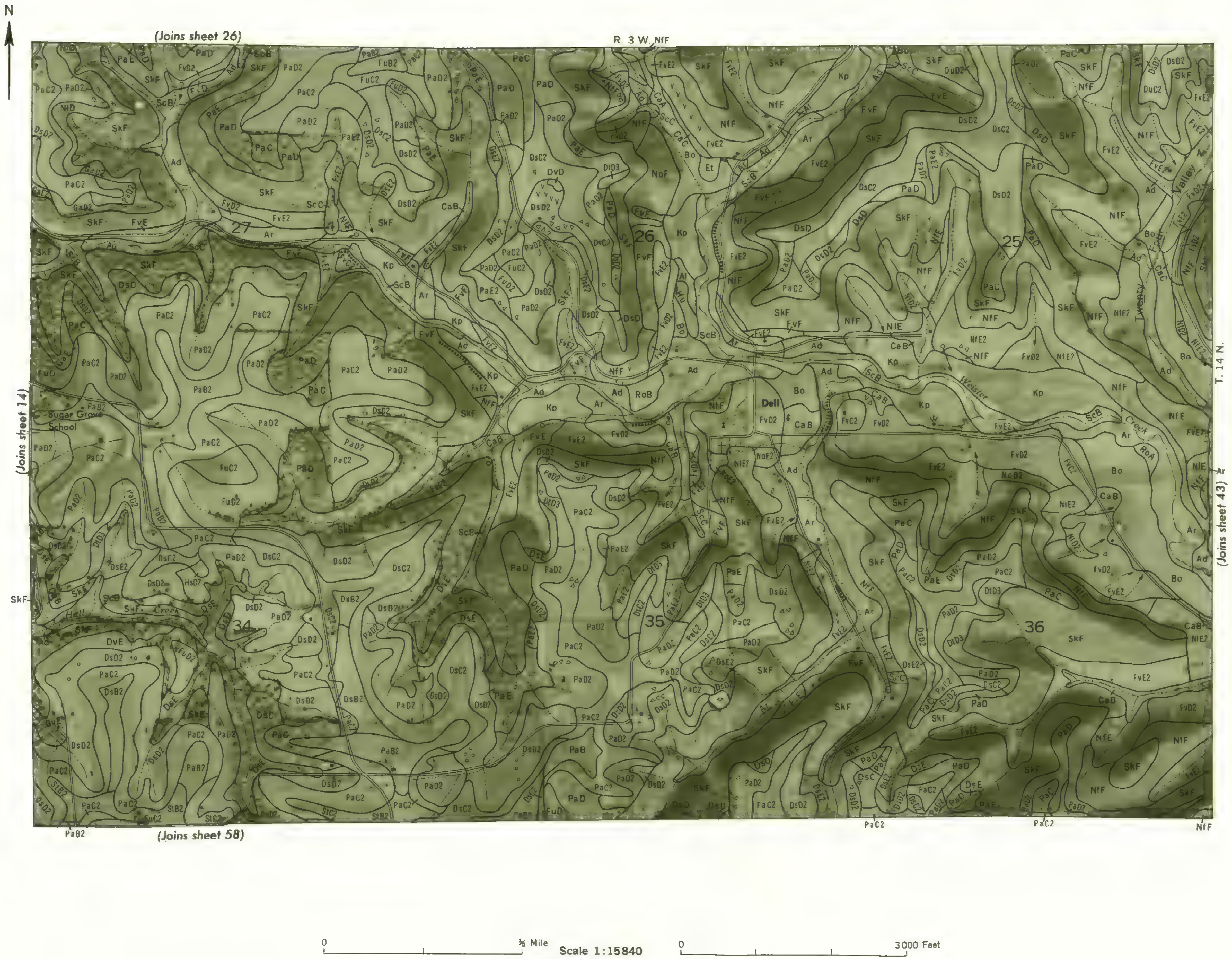
VERNON COUNTY, WISCONSIN NO. 41

Land division corners are approximately positioned on this map.

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

VERNON COUNTY, WISCONSIN — SHEET NUMBER 42



VERNON COUNTY, WISCONSIN NO. 42

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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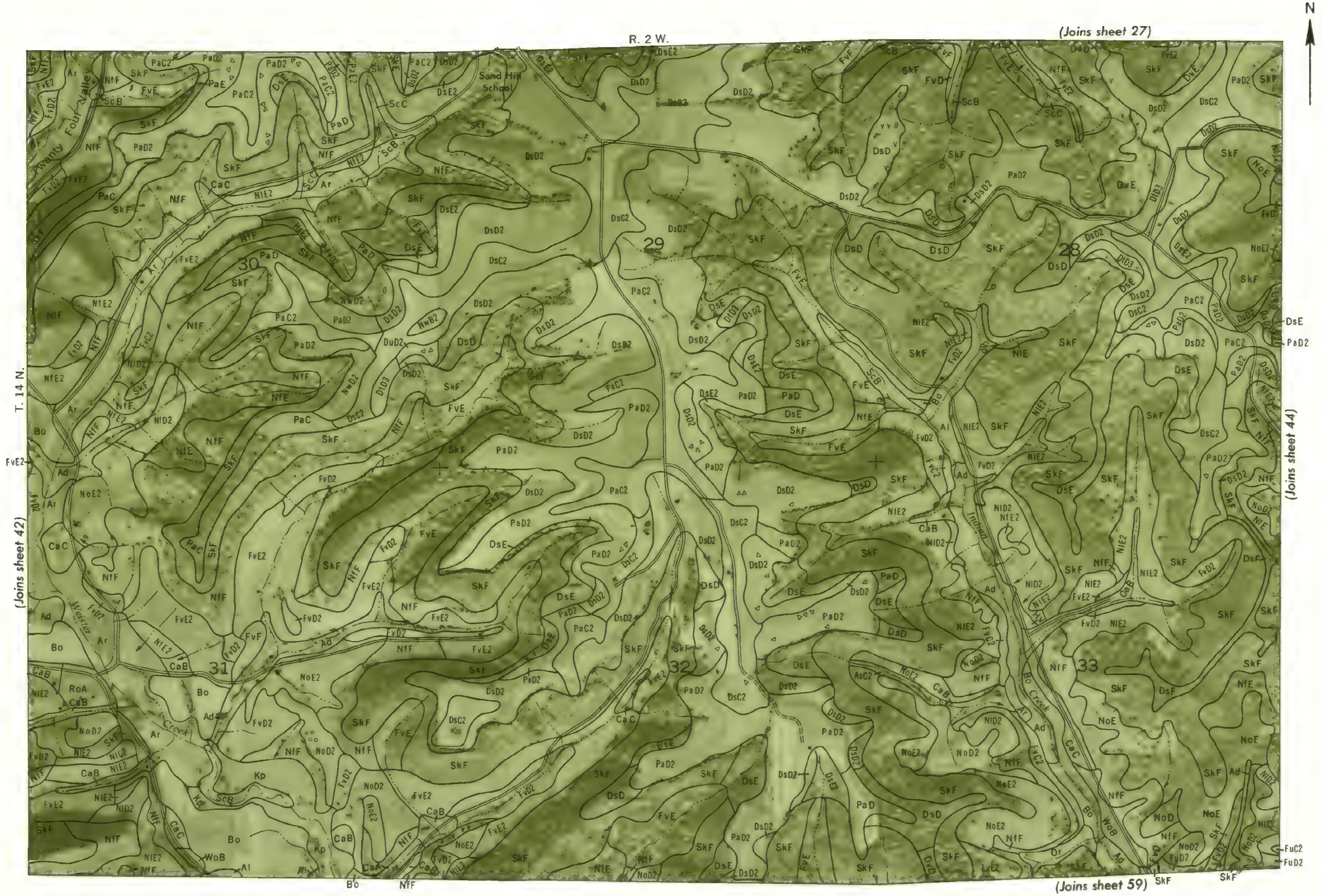
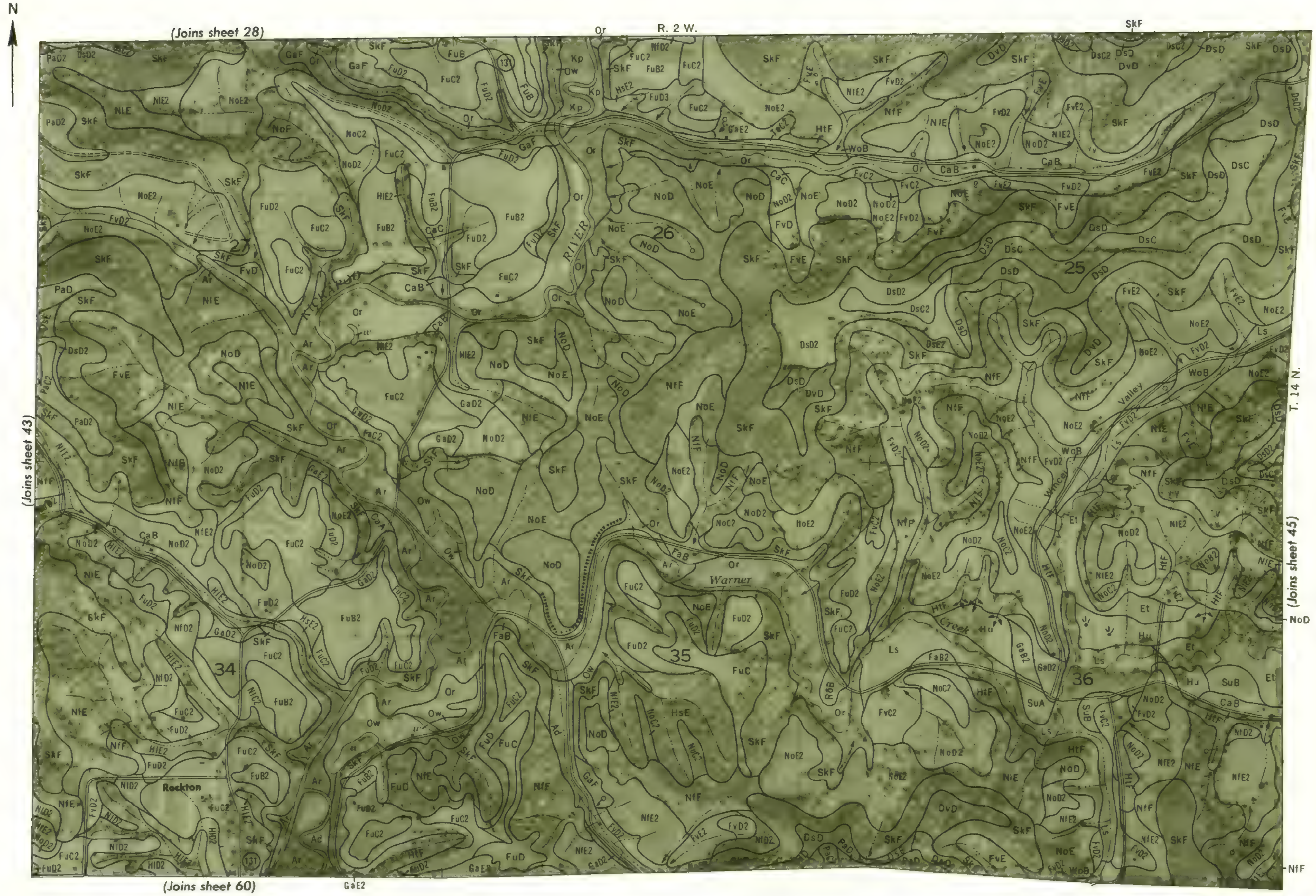
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 43



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 44



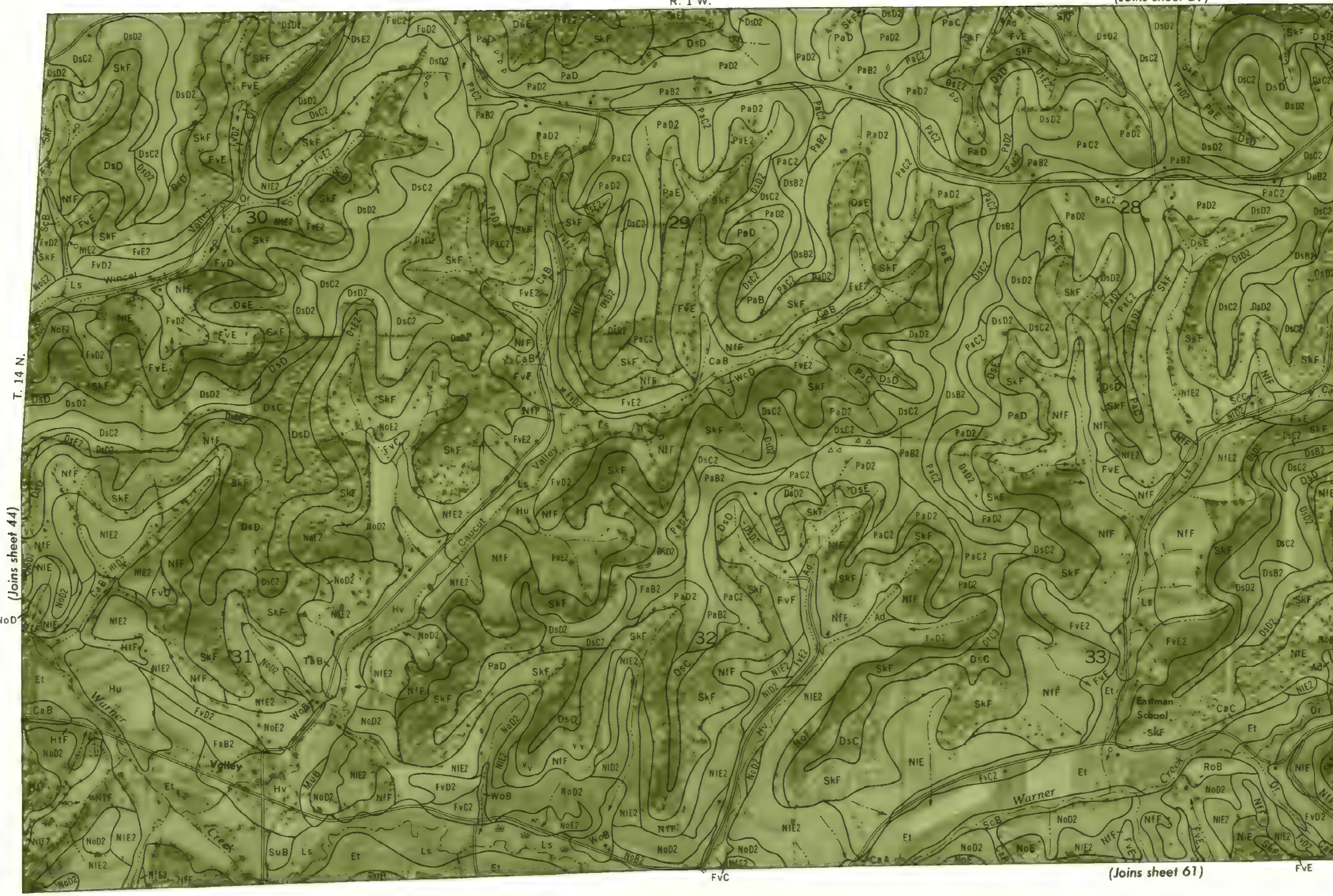
0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 44

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

N



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 45

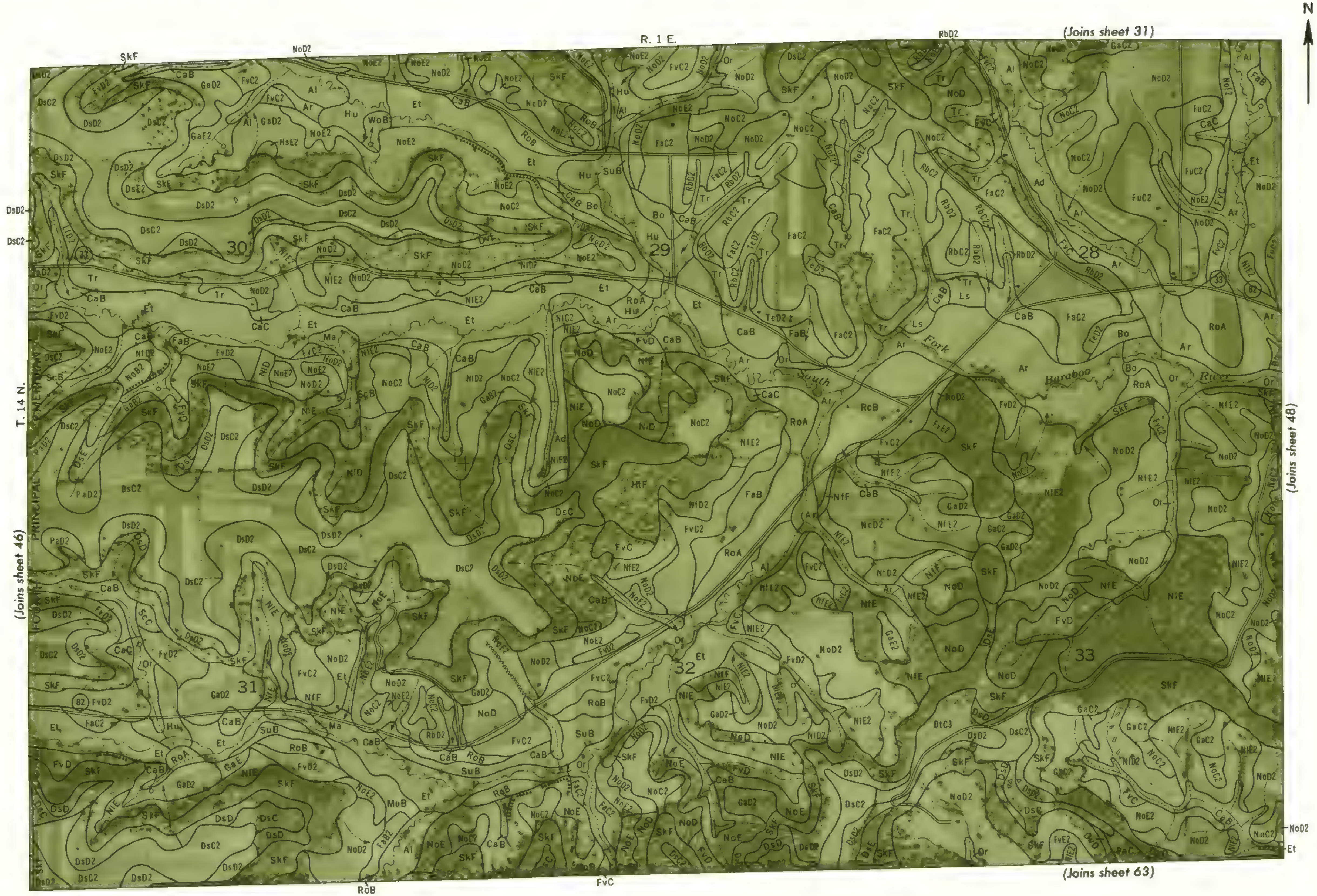
VERNON COUNTY, WISCONSIN — SHEET NUMBER 46

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 46

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 47

VERNON COUNTY, WISCONSIN — SHEET NUMBER 48

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 48

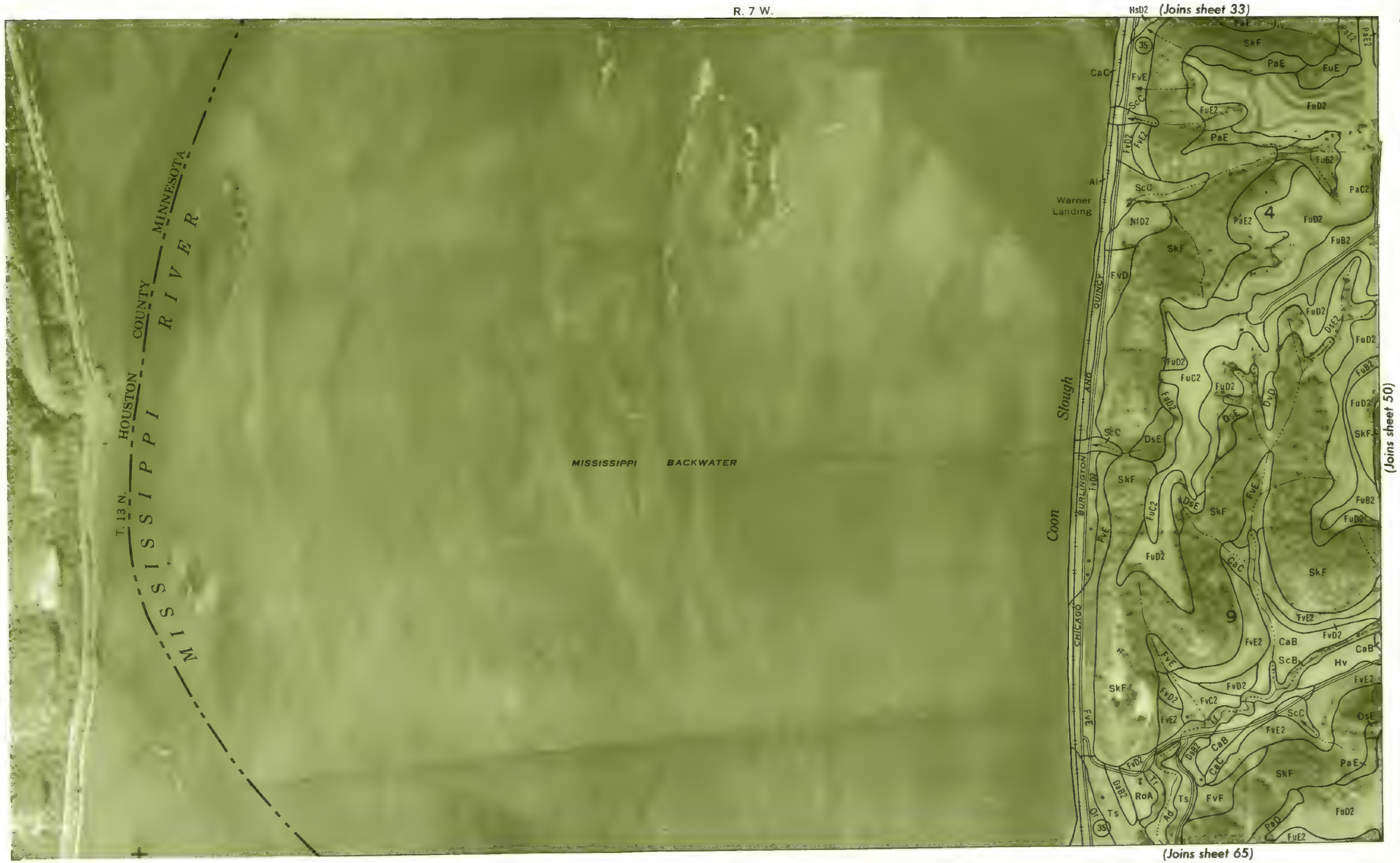
This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 49



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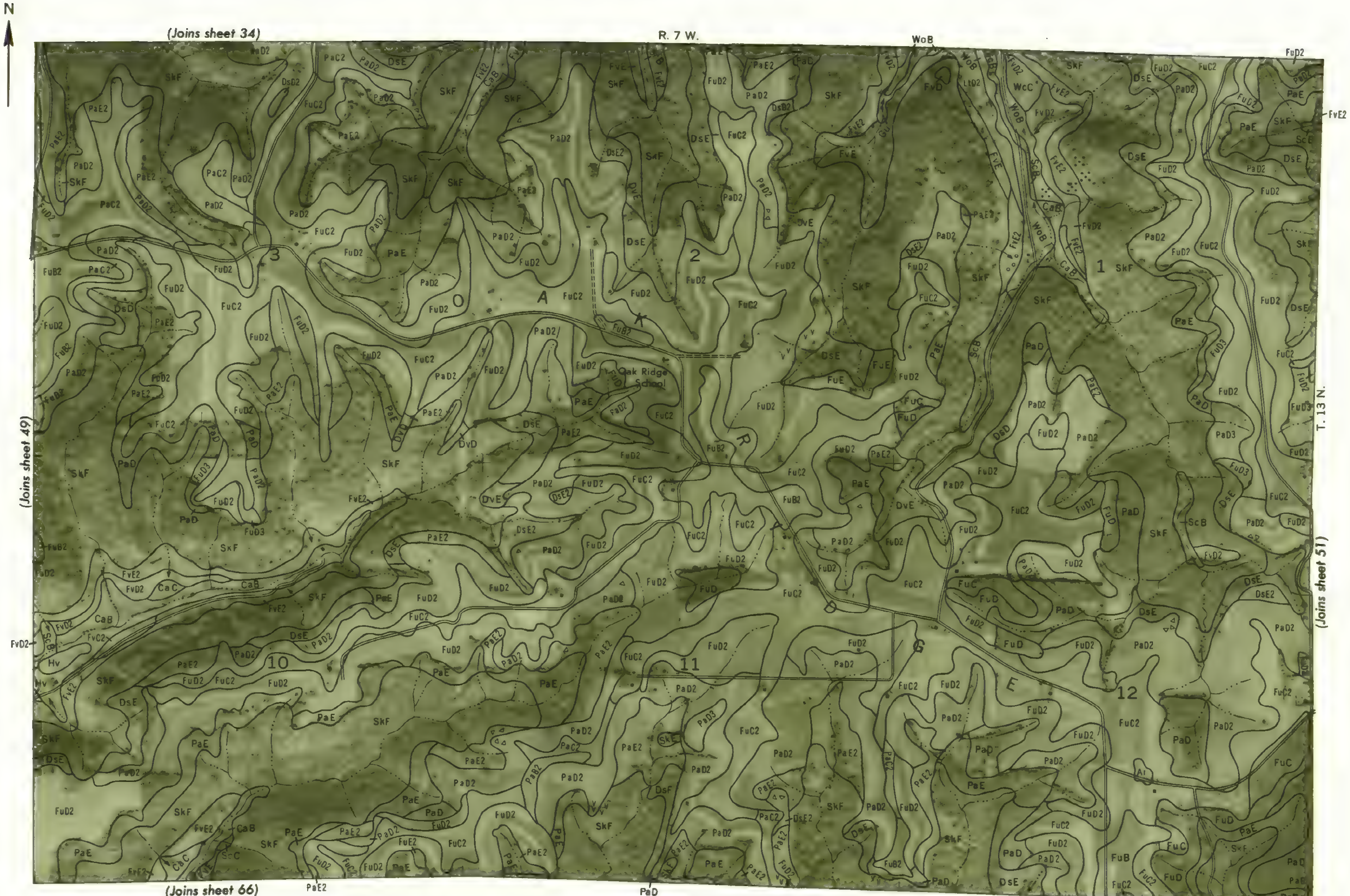


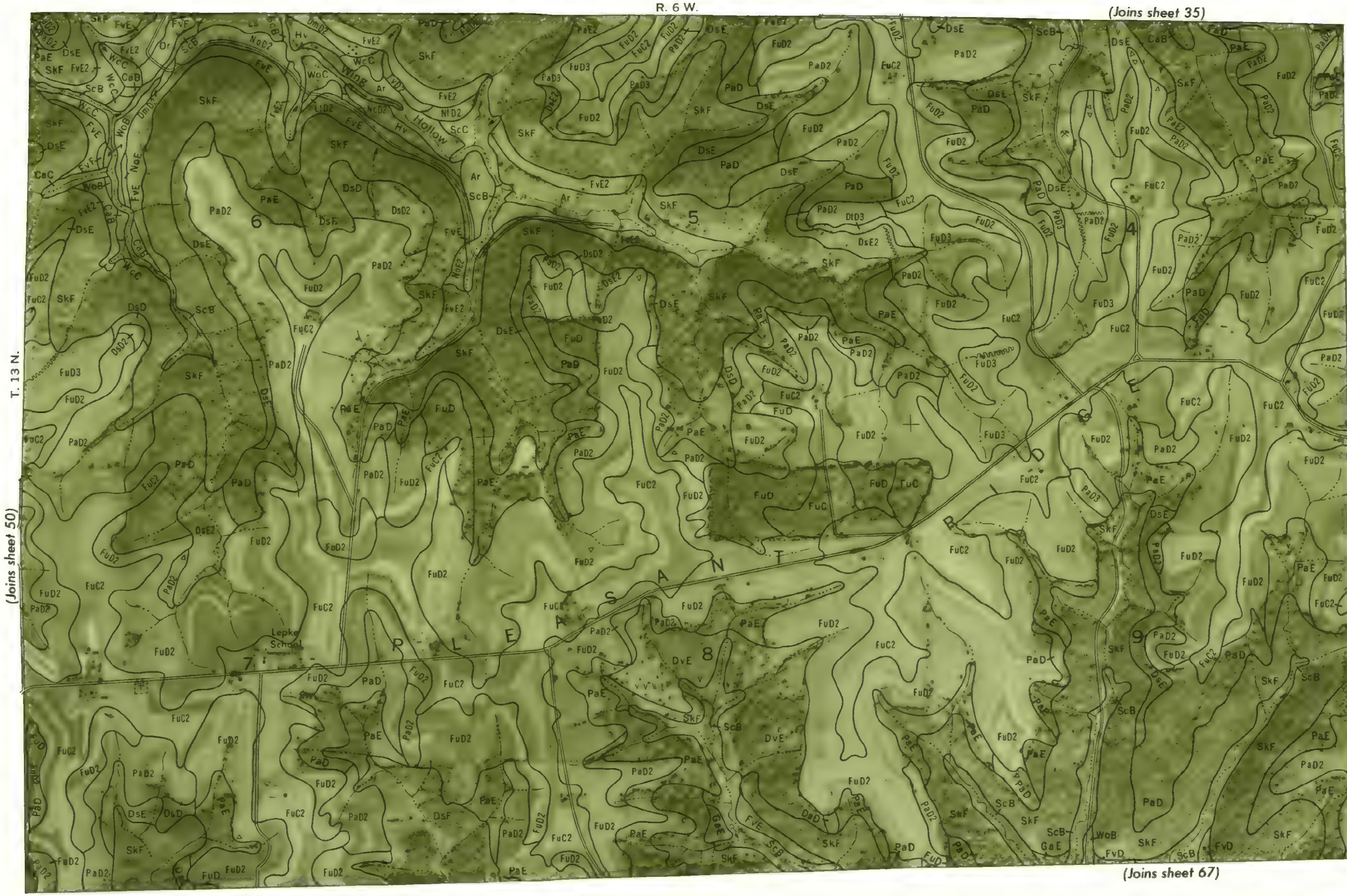
0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 50

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

N



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 51

VERNON COUNTY, WISCONSIN — SHEET NUMBER 52

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 52

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

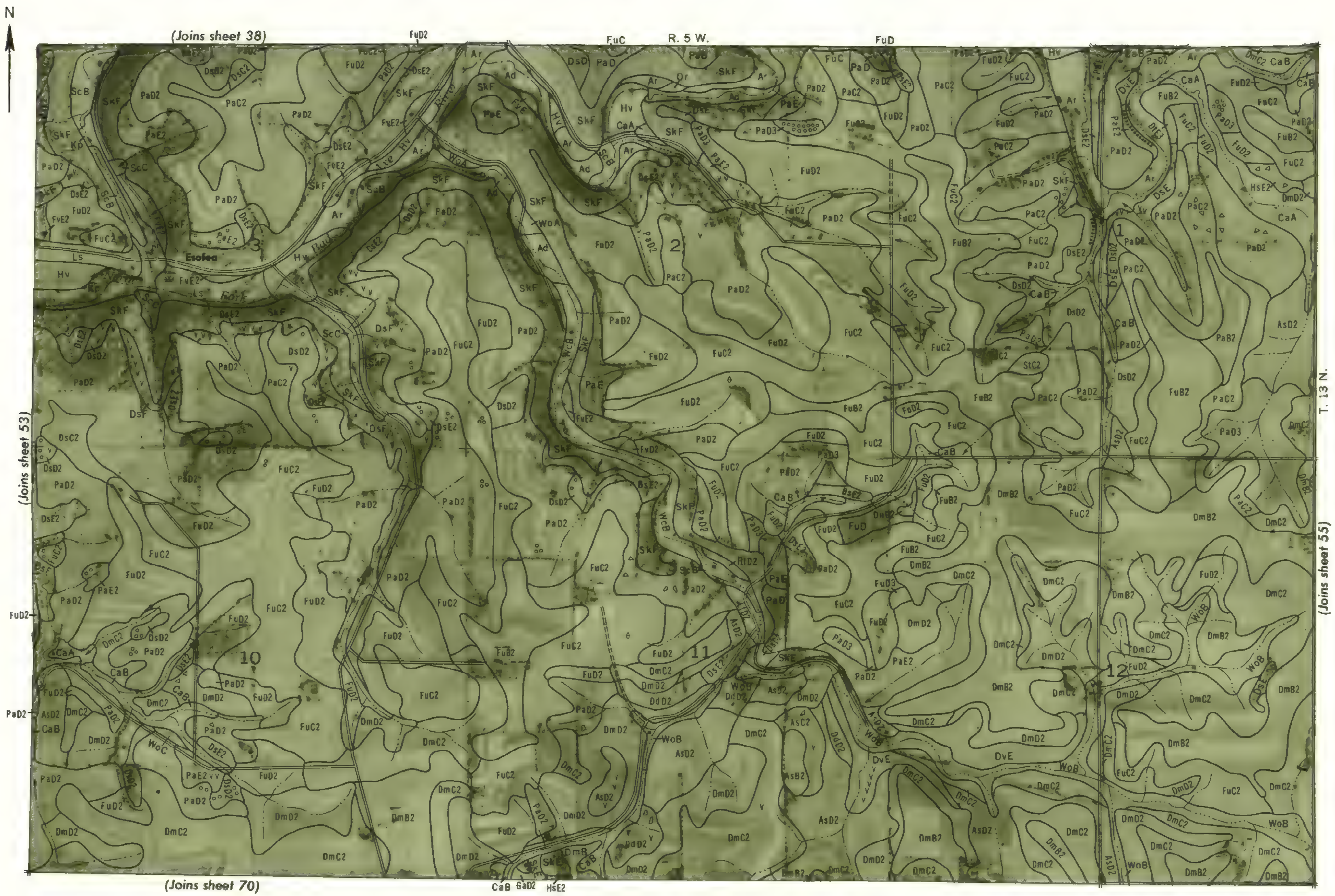
0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 53

VERNON COUNTY, WISCONSIN — SHEET NUMBER 54



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 54

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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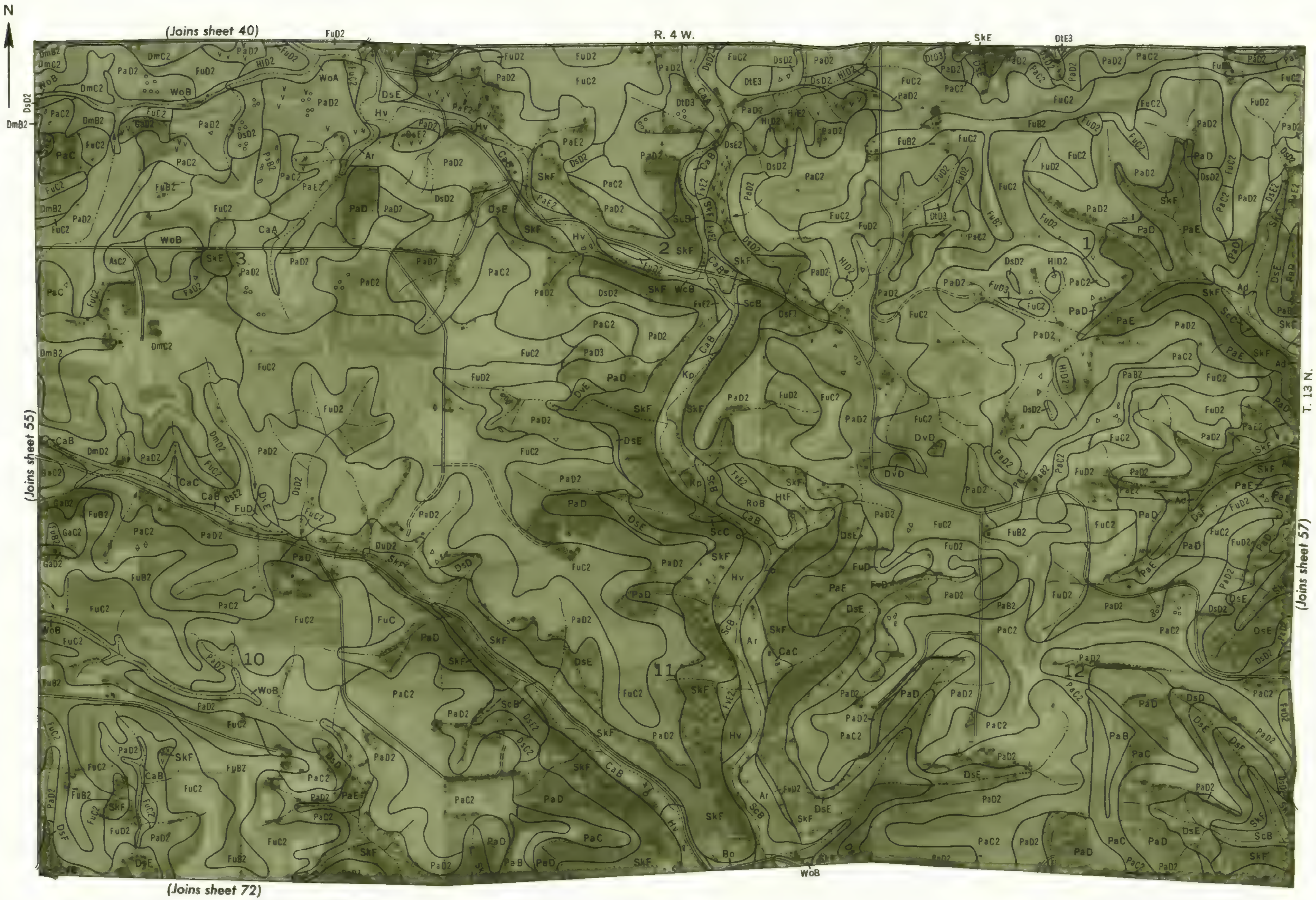
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 55

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 56

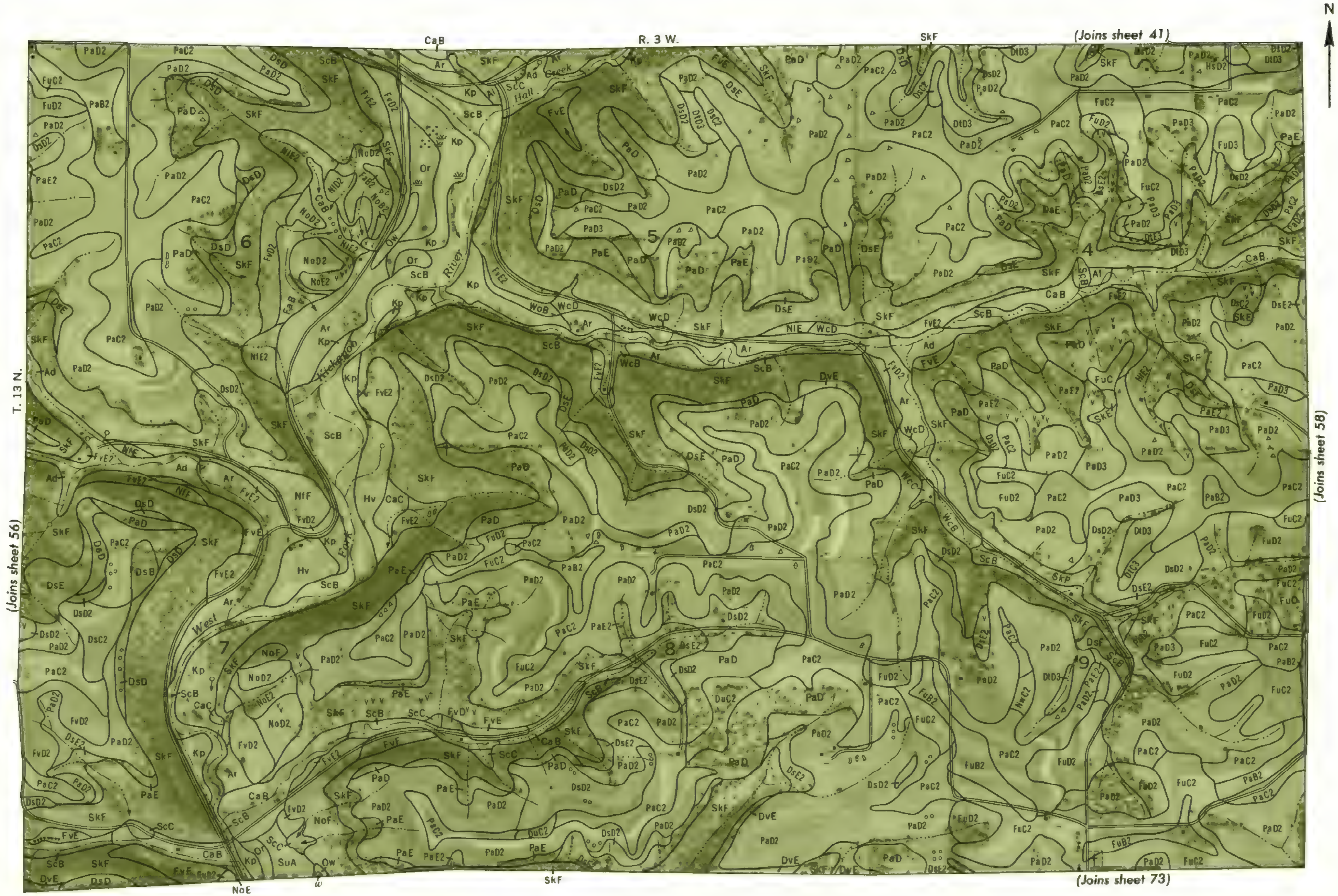


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 56

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.



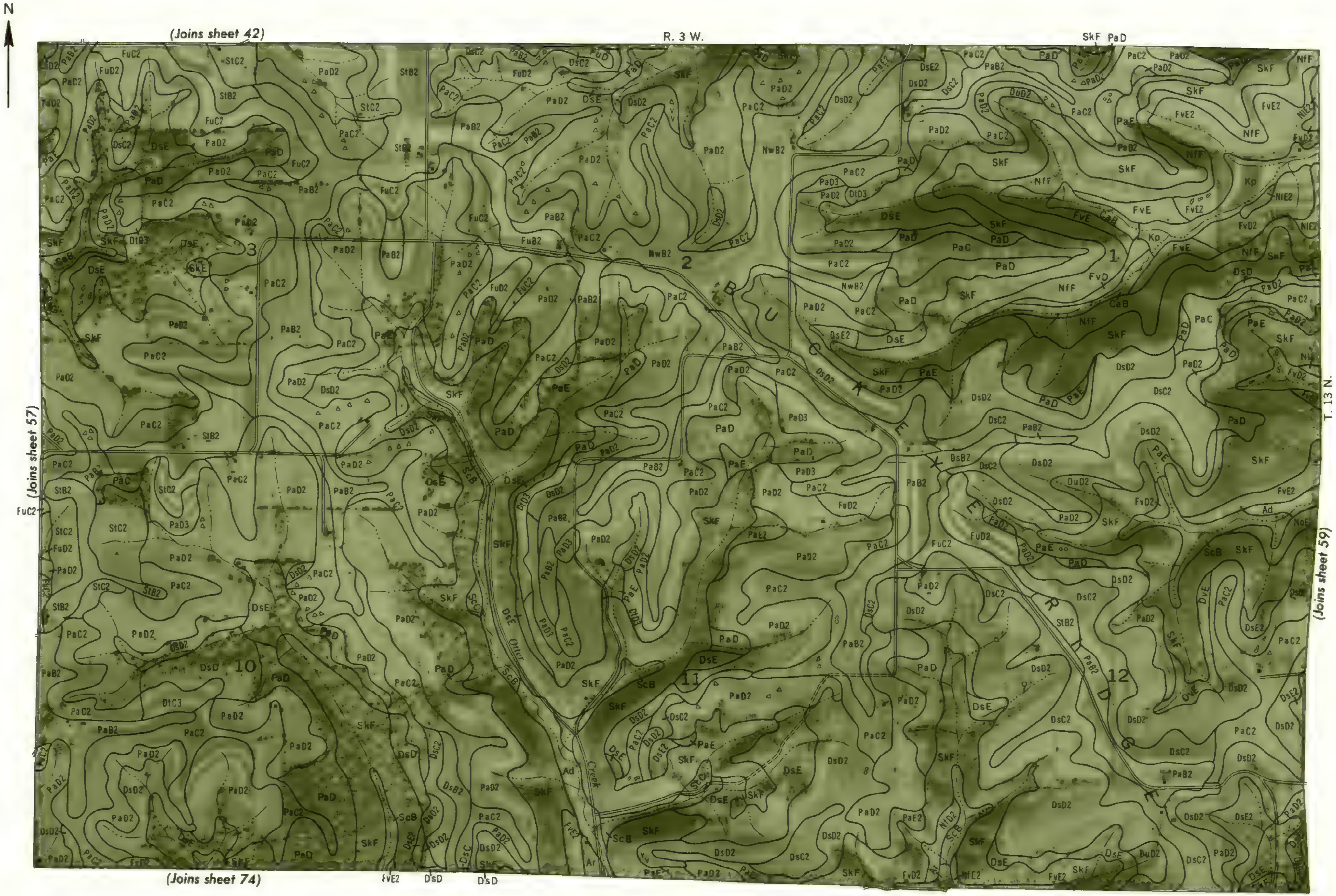
0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 57

VERNON COUNTY, WISCONSIN — SHEET NUMBER 58



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 58

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 59

N

R. 2 W.

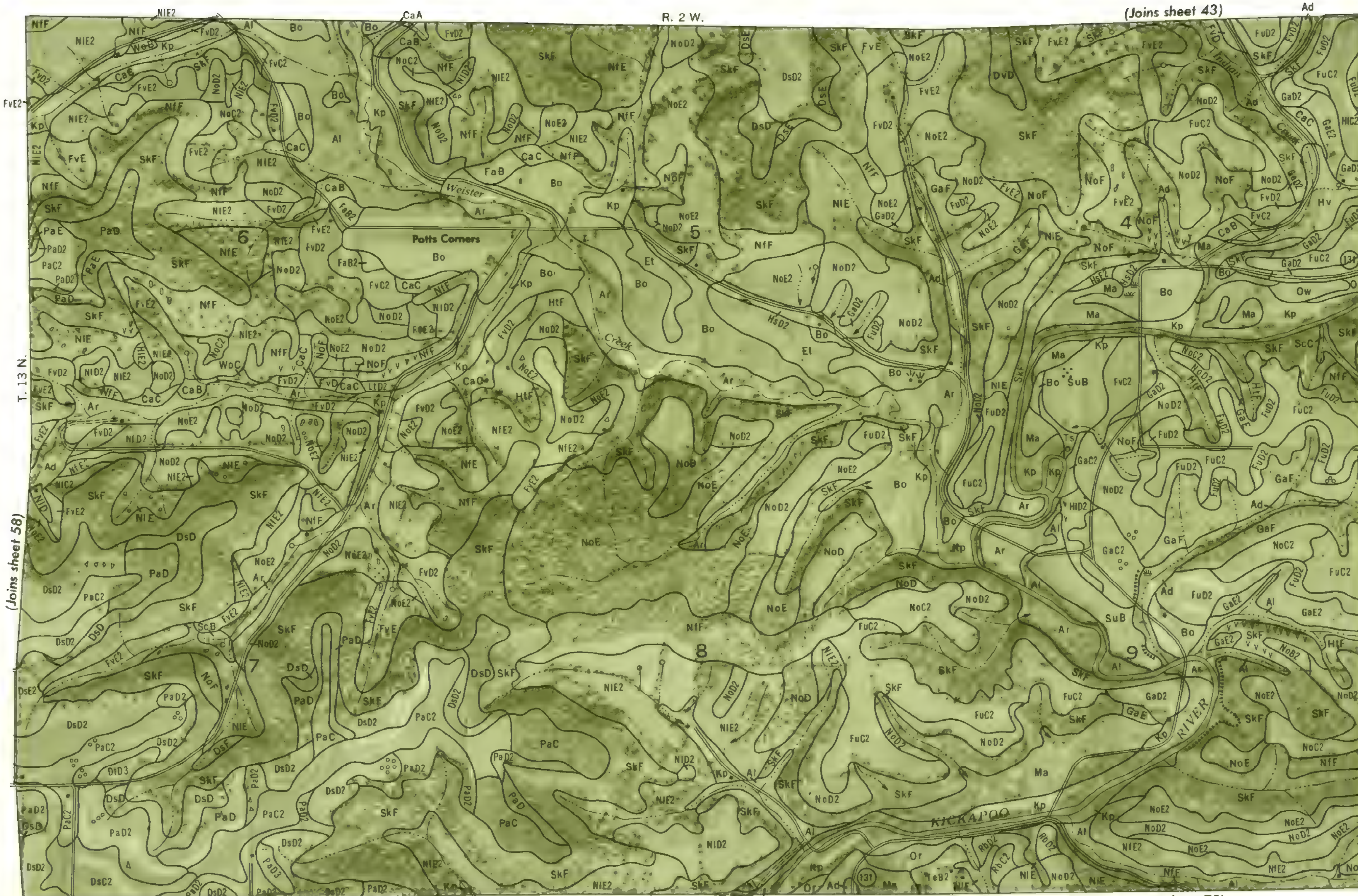
T. 13 N.

(Joins sheet 43)

(Joins sheet 58)

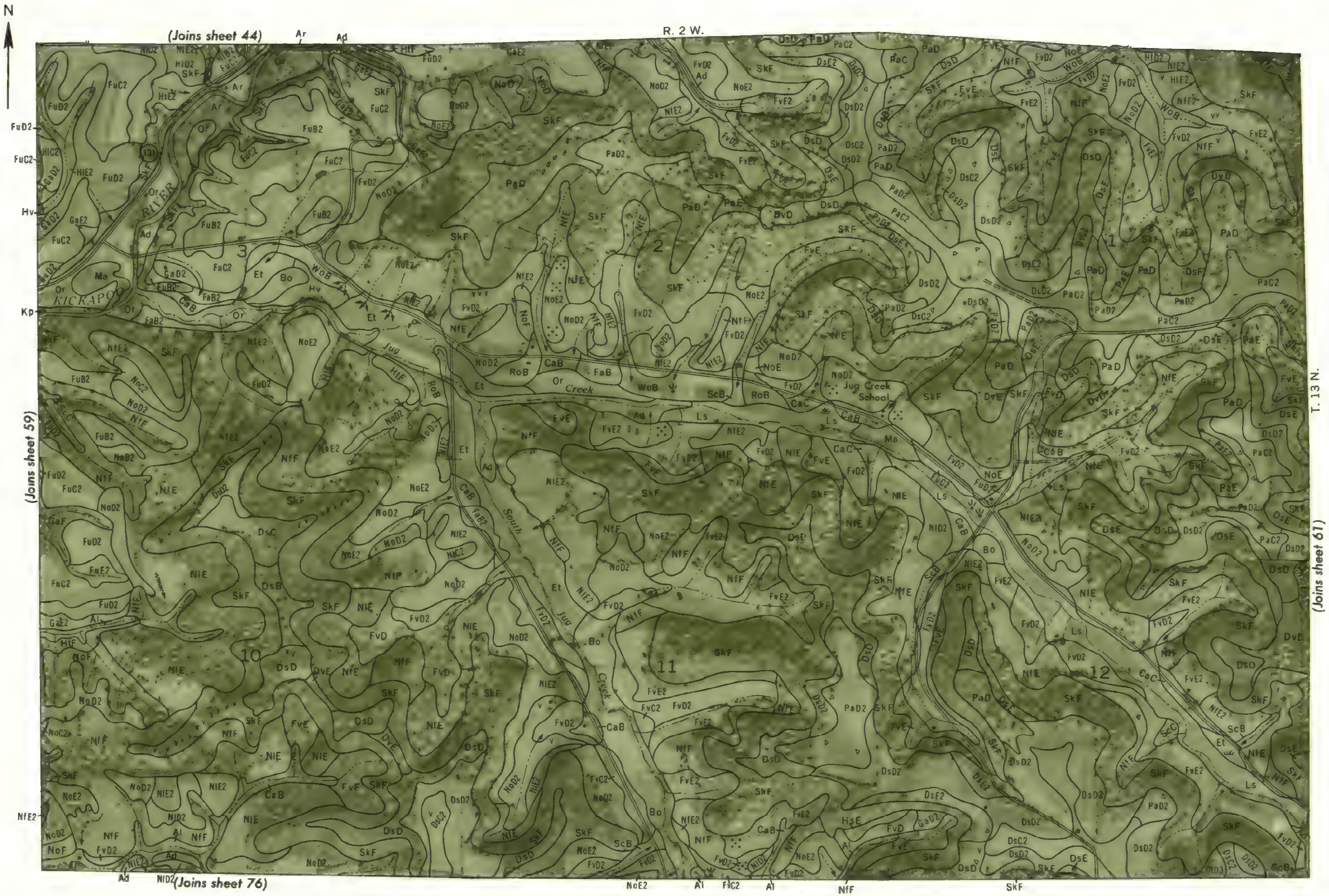
(Joins sheet 60)

(Joins sheet 75)



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 60

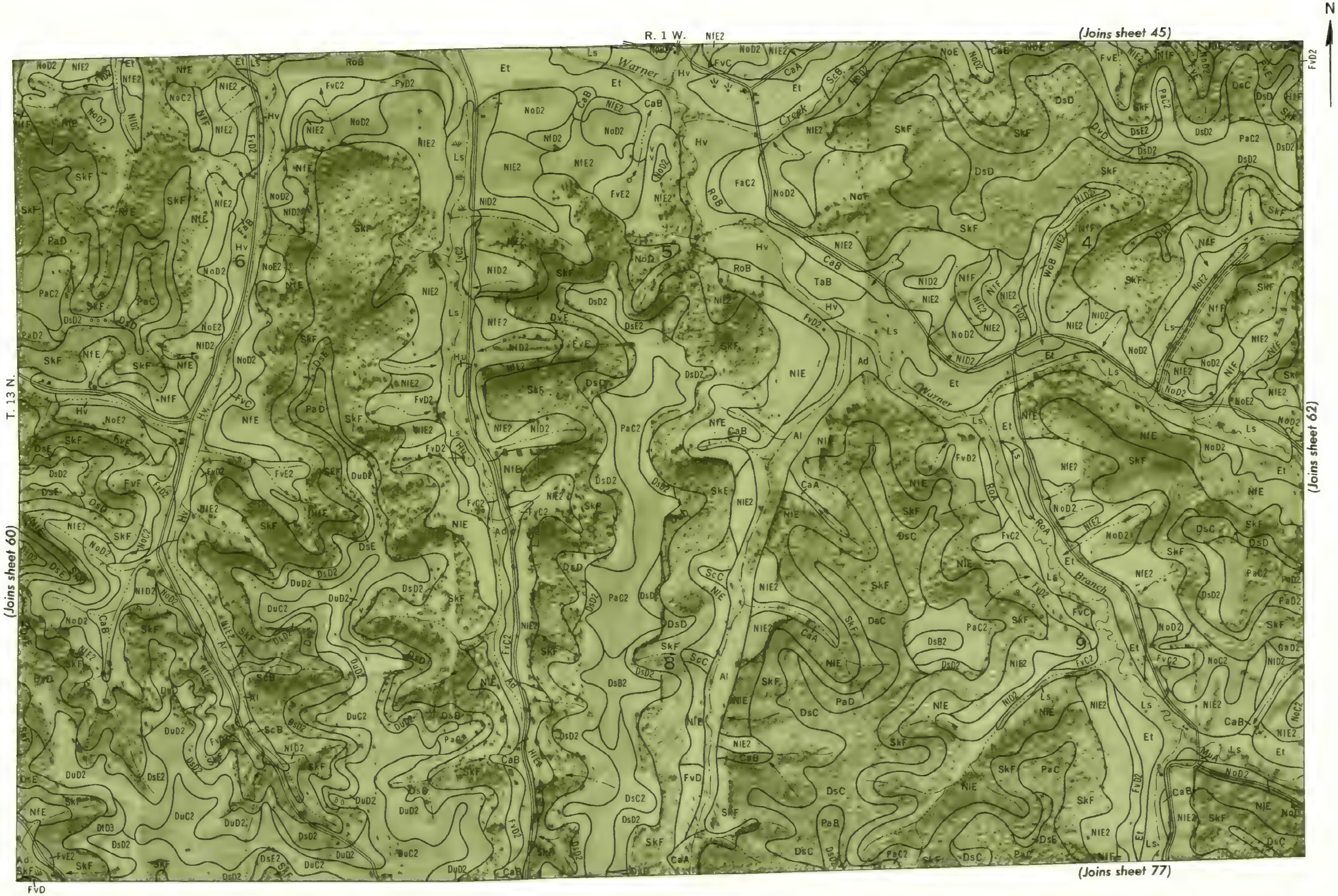


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 60

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 61

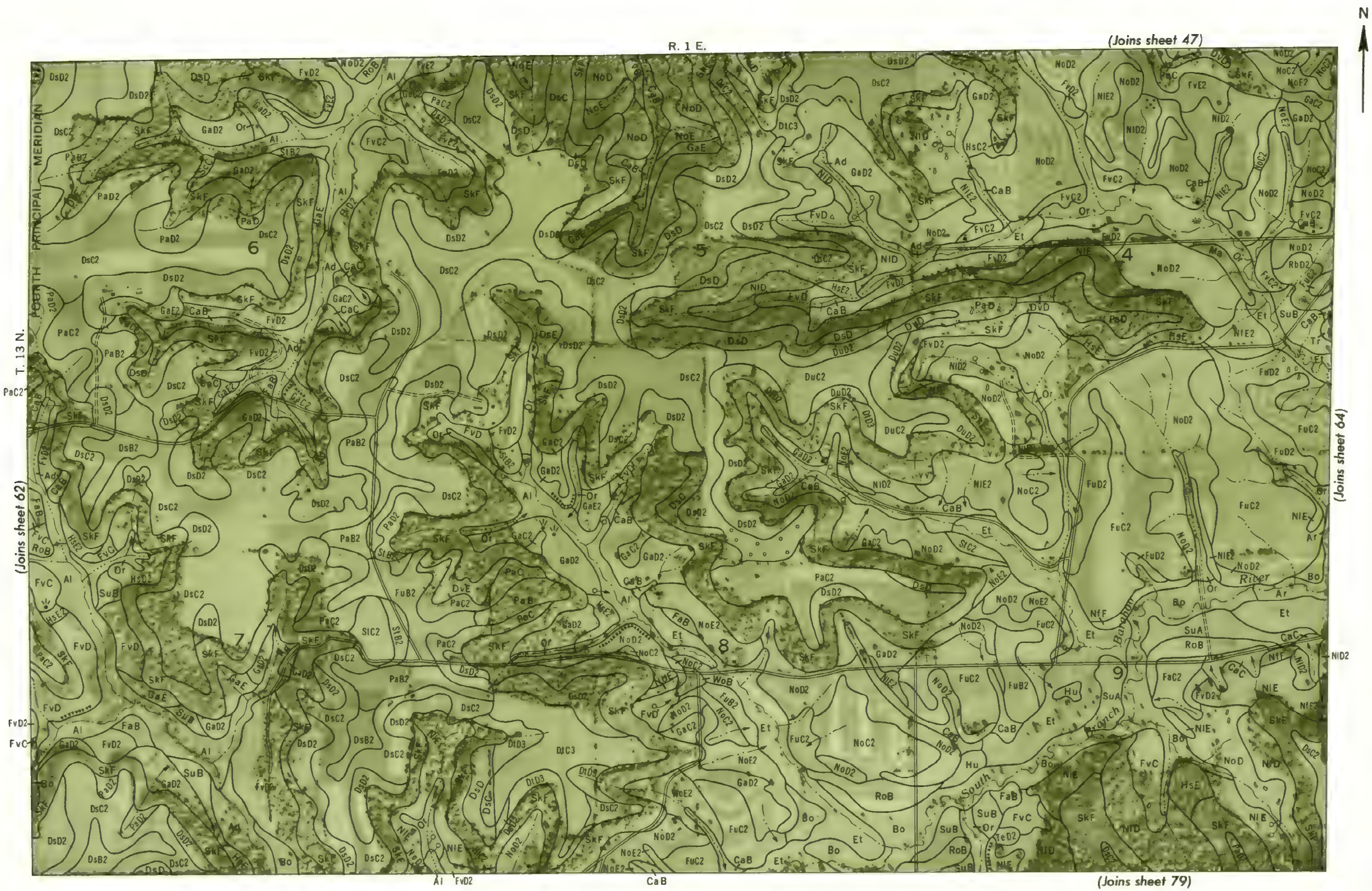
VERNON COUNTY, WISCONSIN — SHEET NUMBER 62

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 62

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 63

64

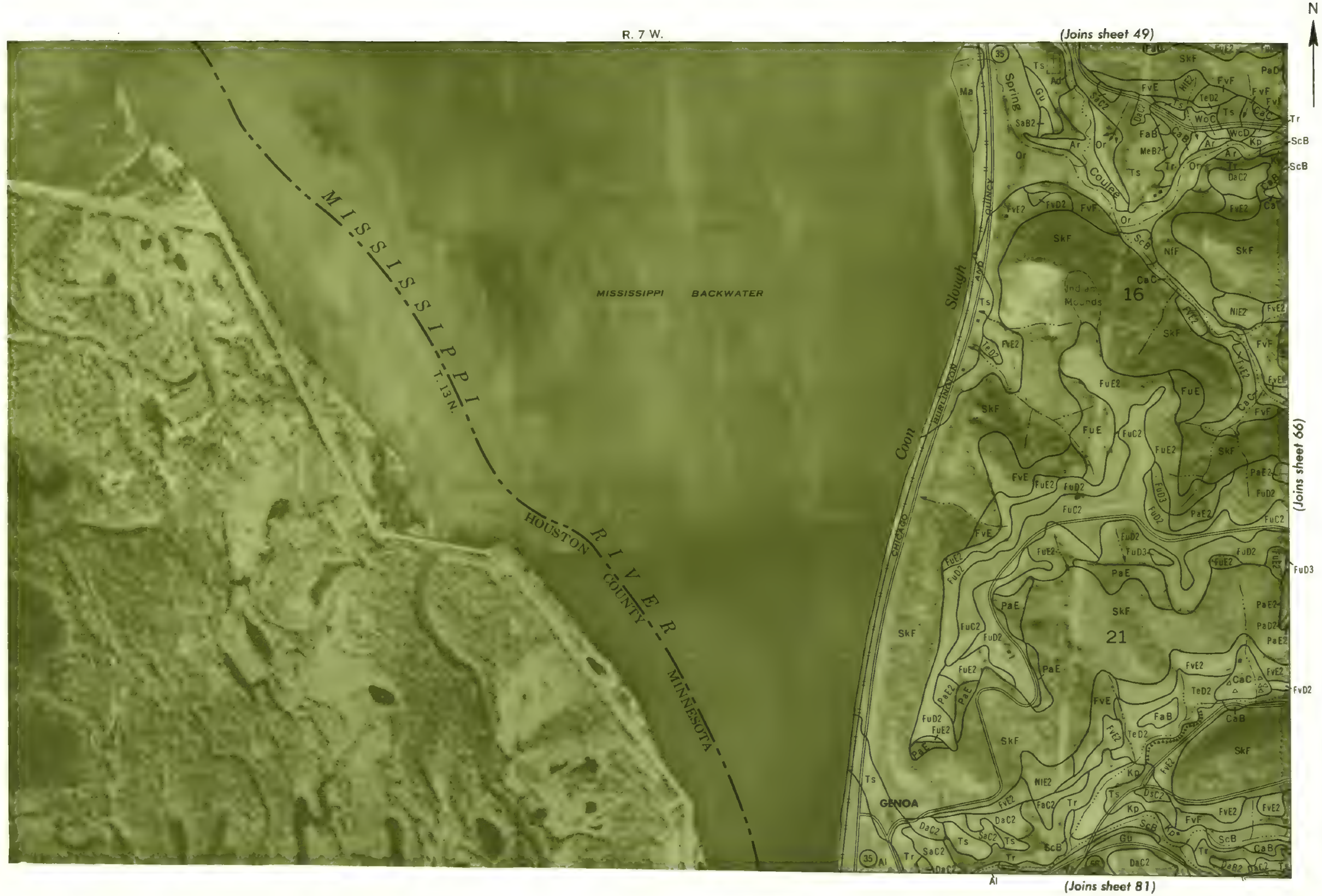
VERNON COUNTY, WISCONSIN — SHEET NUMBER 64

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 64

This map is one of a set of compiled in 1958 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

VERNON COUNTY, WISCONSIN NO. 65

Land division corners are approximately positioned on this map.

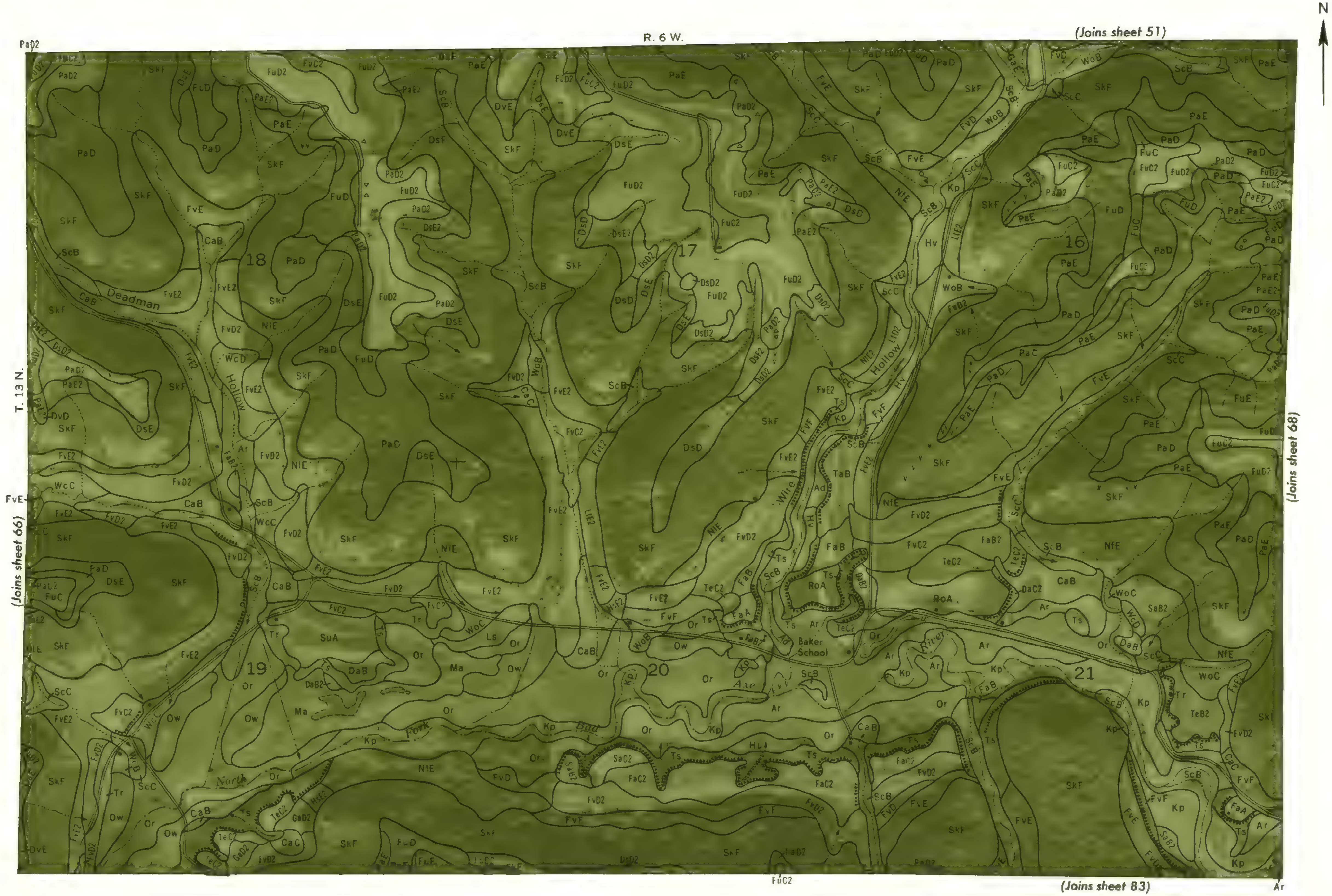
VERNON COUNTY, WISCONSIN — SHEET NUMBER 66

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 66

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



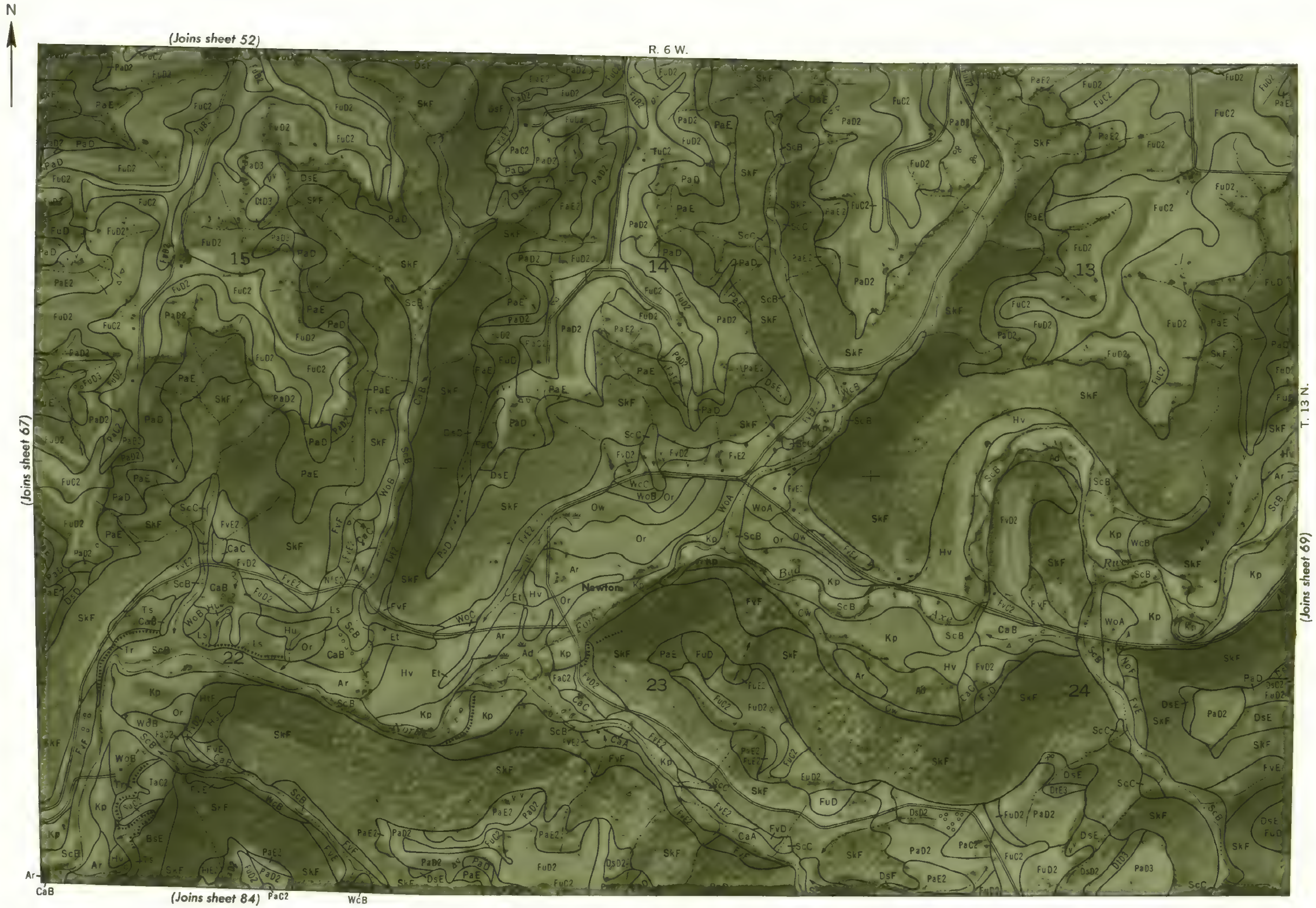
0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 67

VERNON COUNTY, WISCONSIN — SHEET NUMBER 68

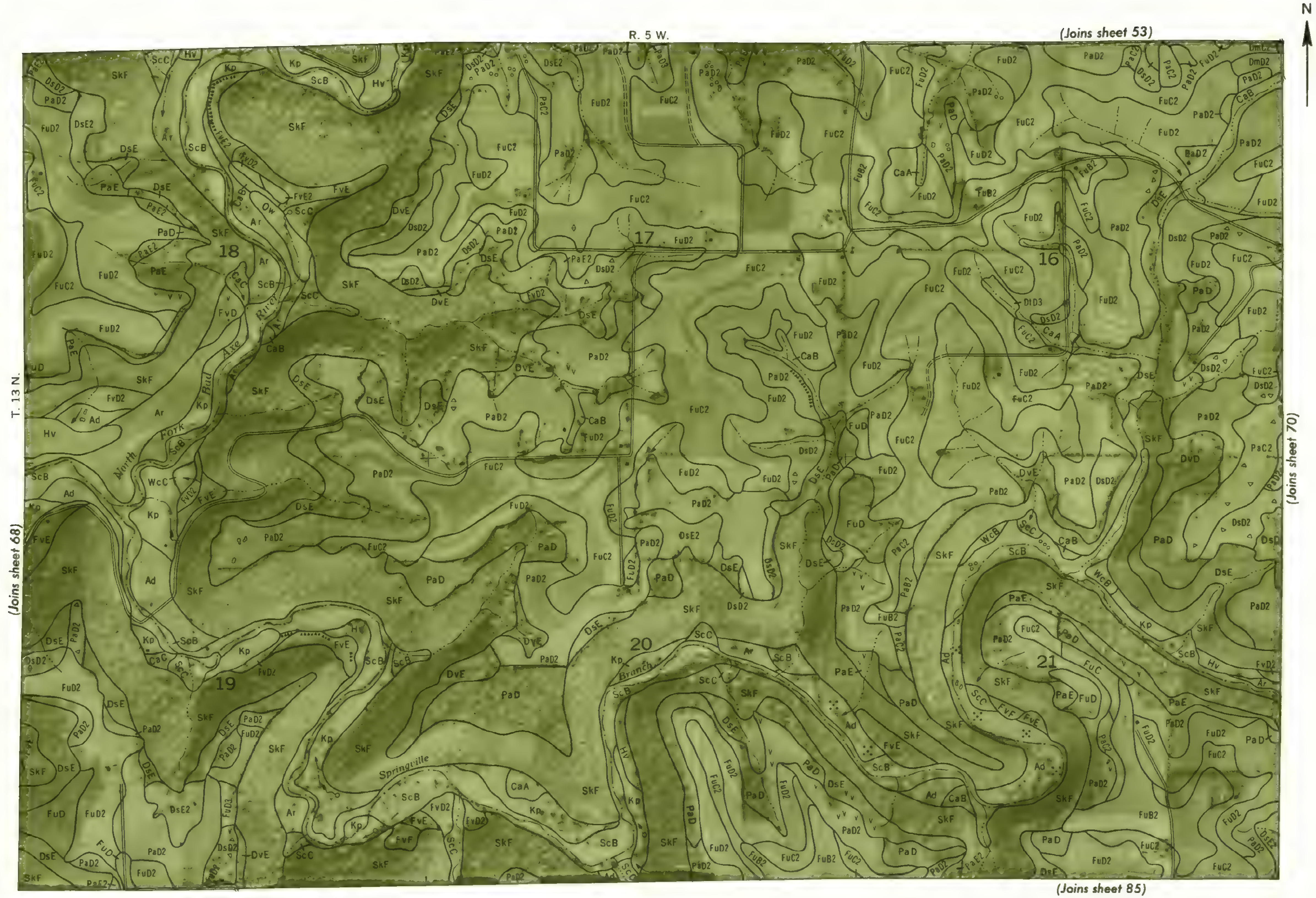


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 68

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

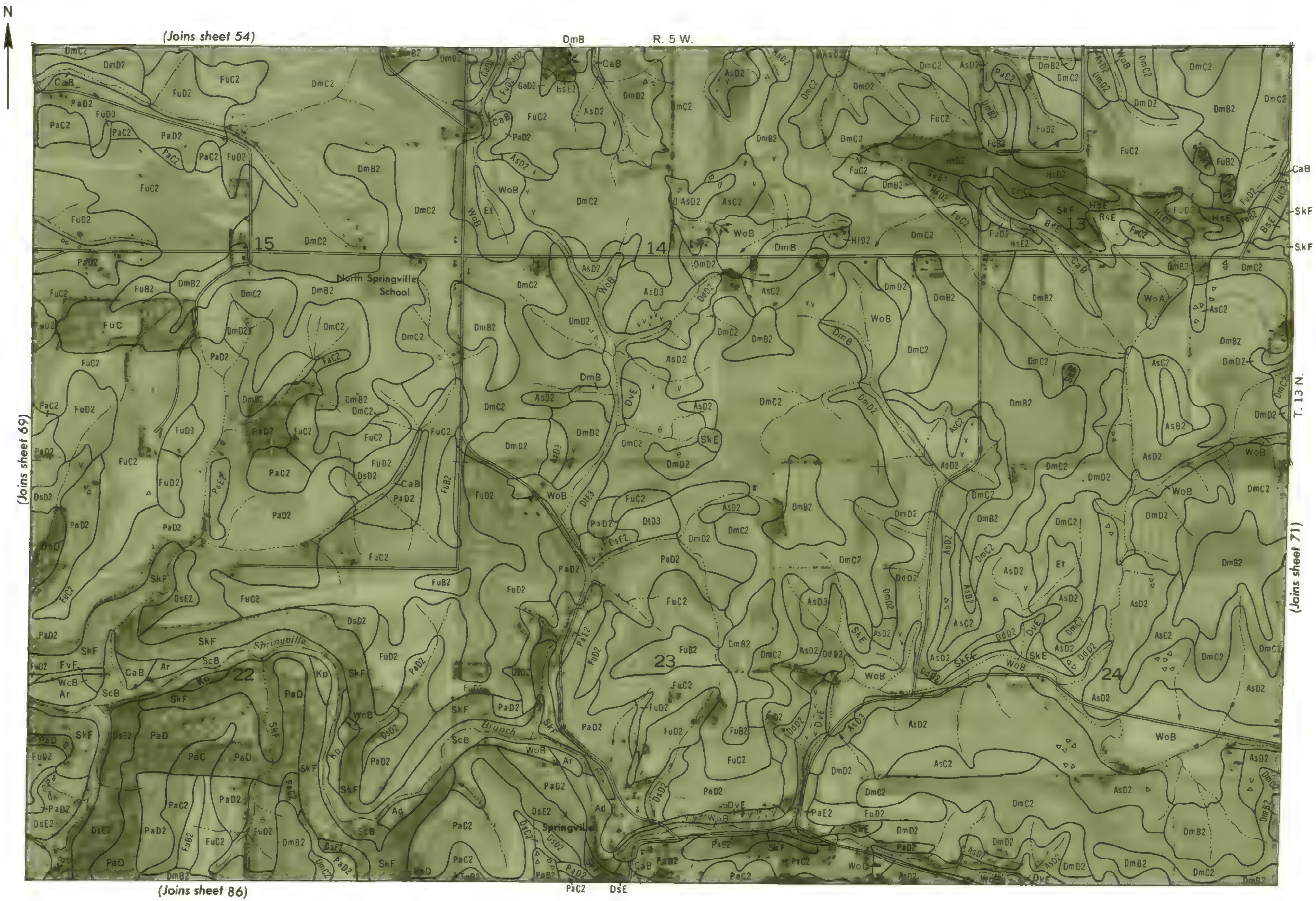


0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN — SHEET NUMBER 70



0 ½ Mile Scale 1:15840 0 3,000 Feet

VERNON COUNTY, WISCONSIN NO. 70

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

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Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 71

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 72

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 72

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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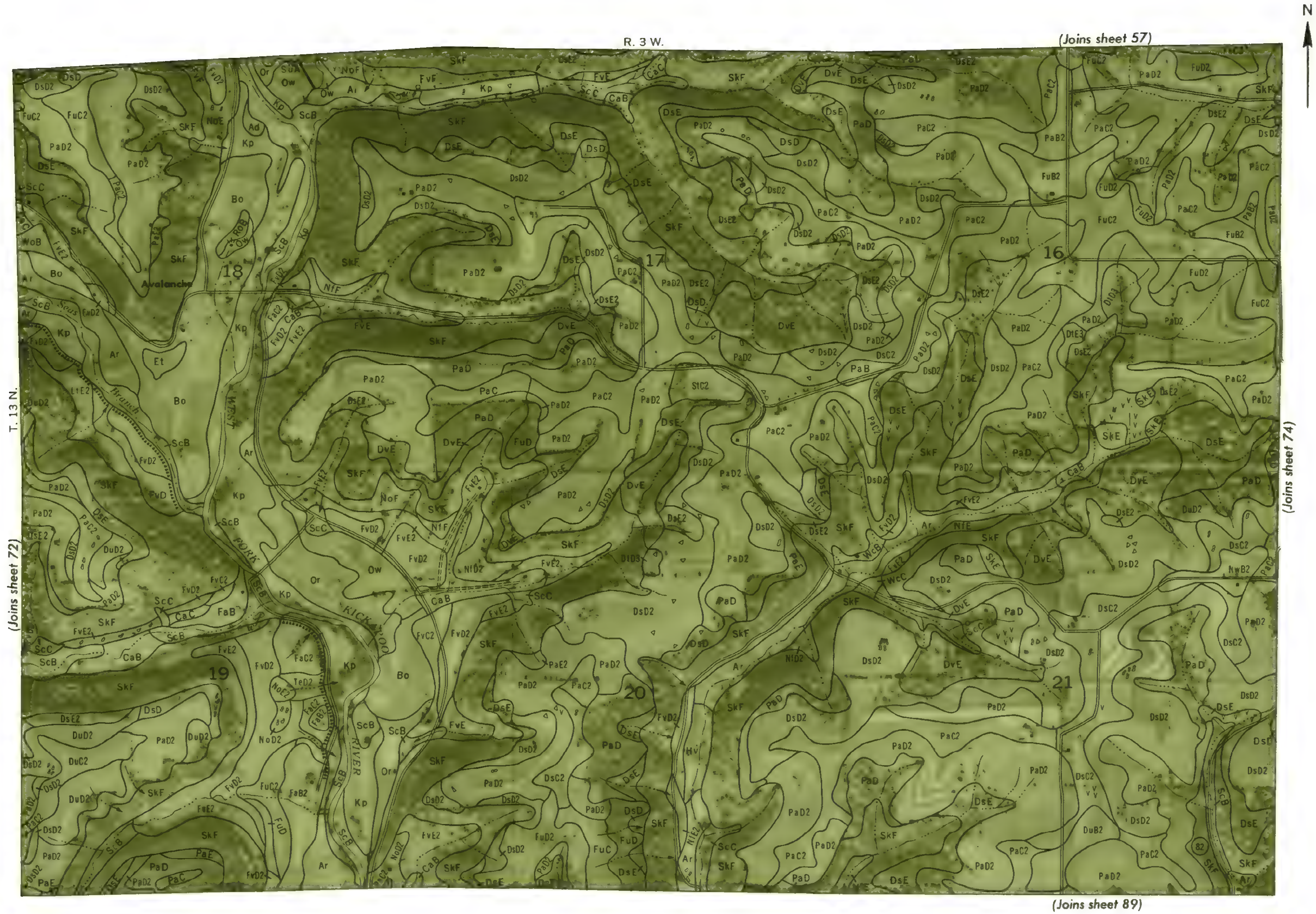
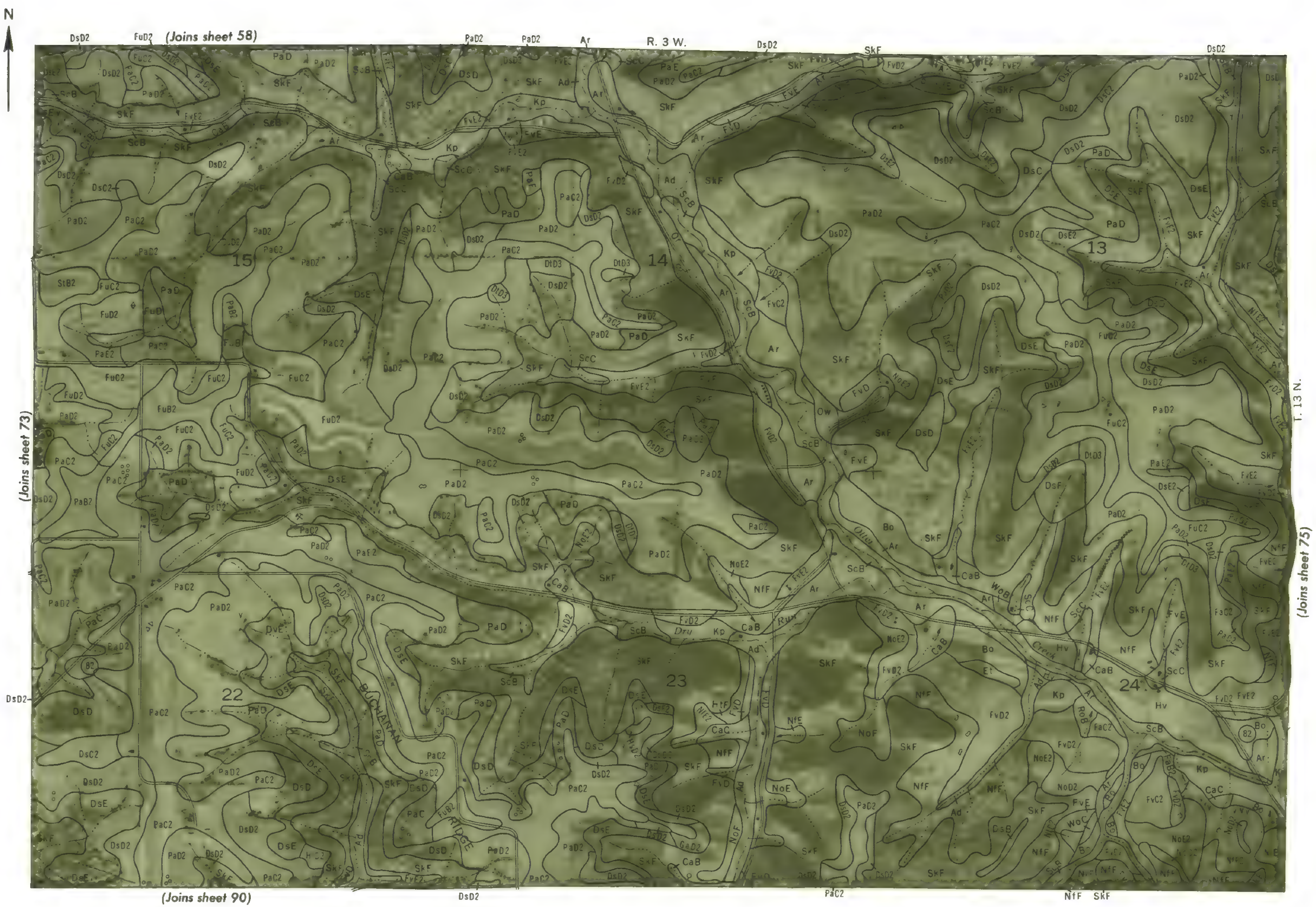
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 73



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 74

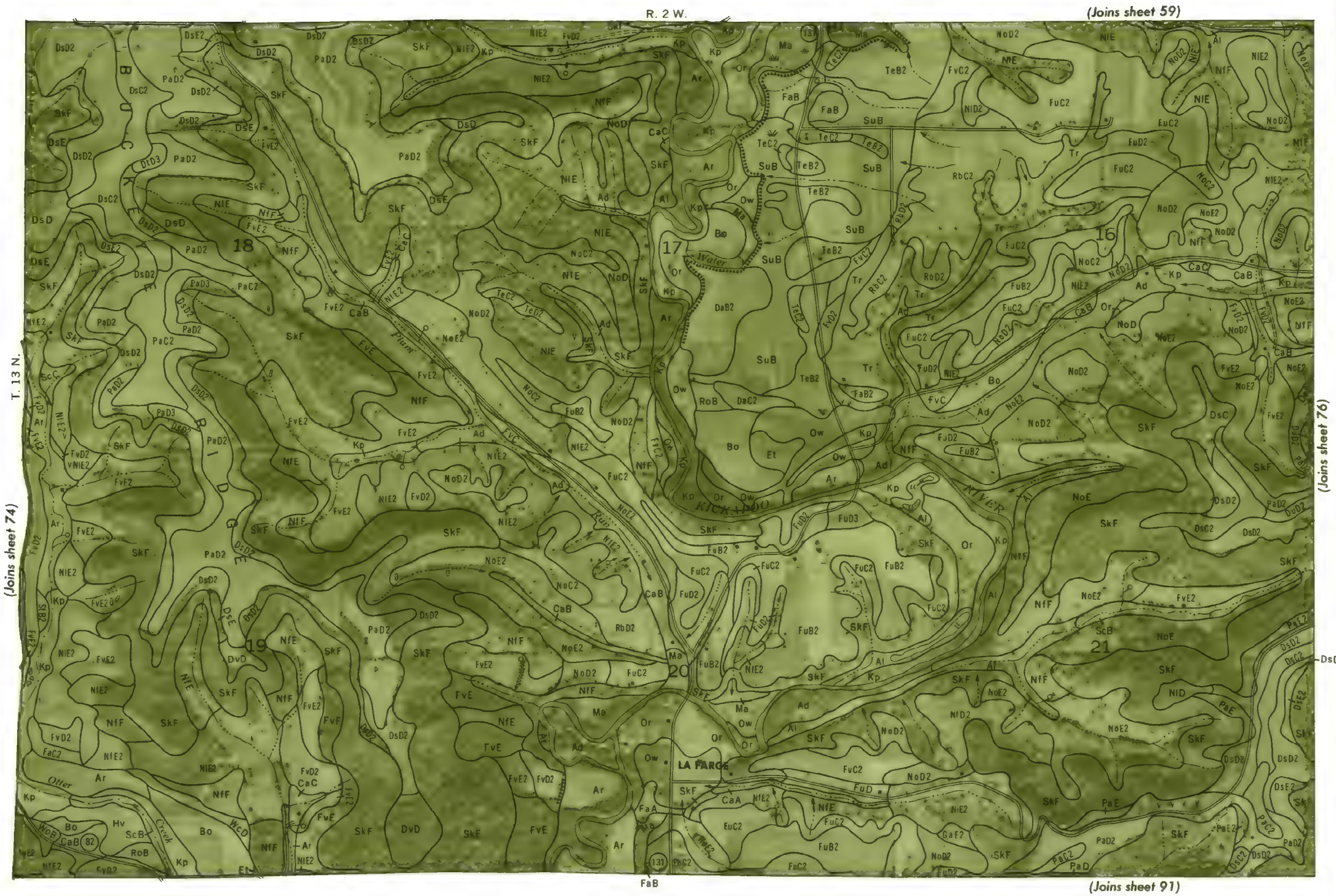


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 74

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

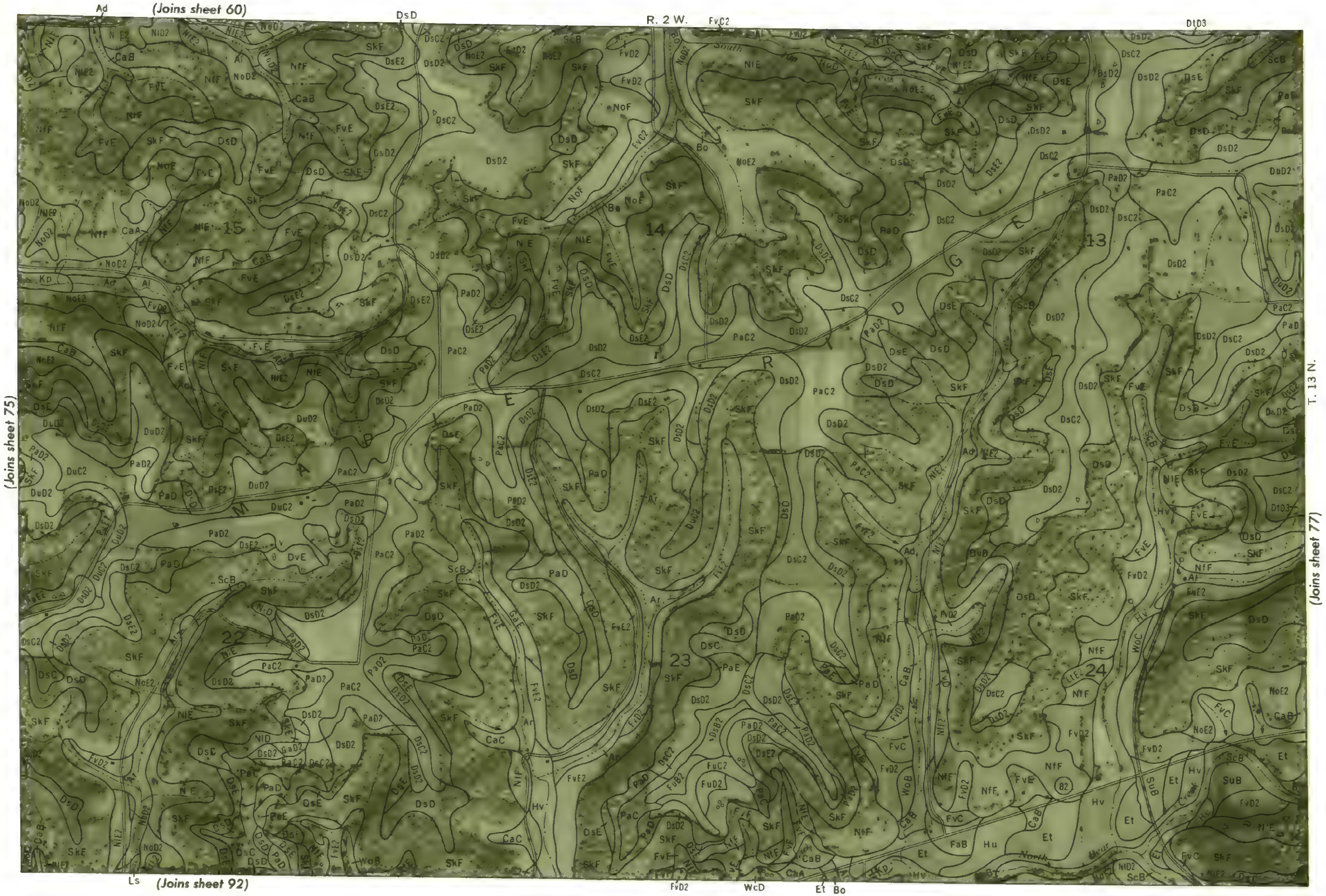
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 75

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 76

N

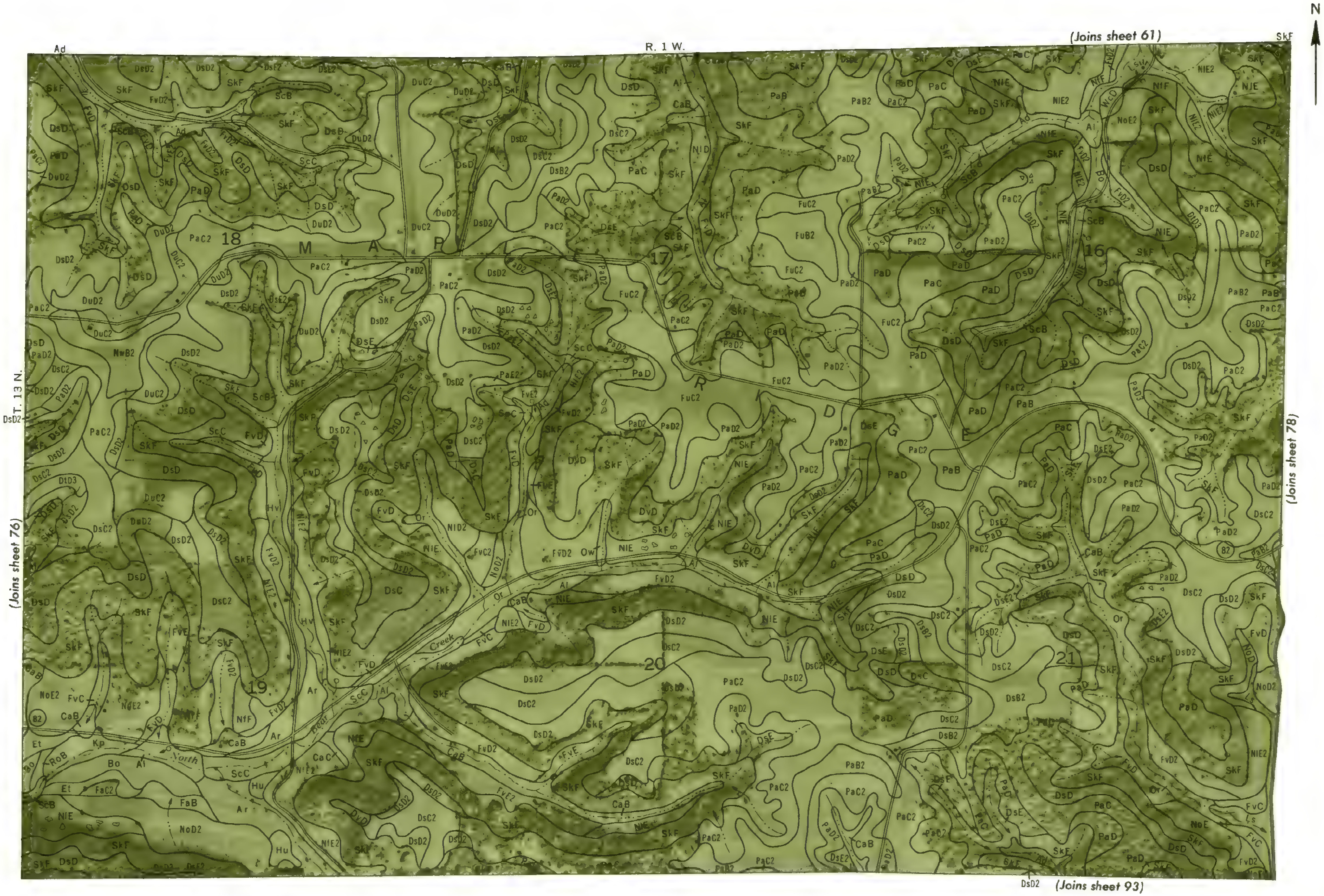


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 76

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

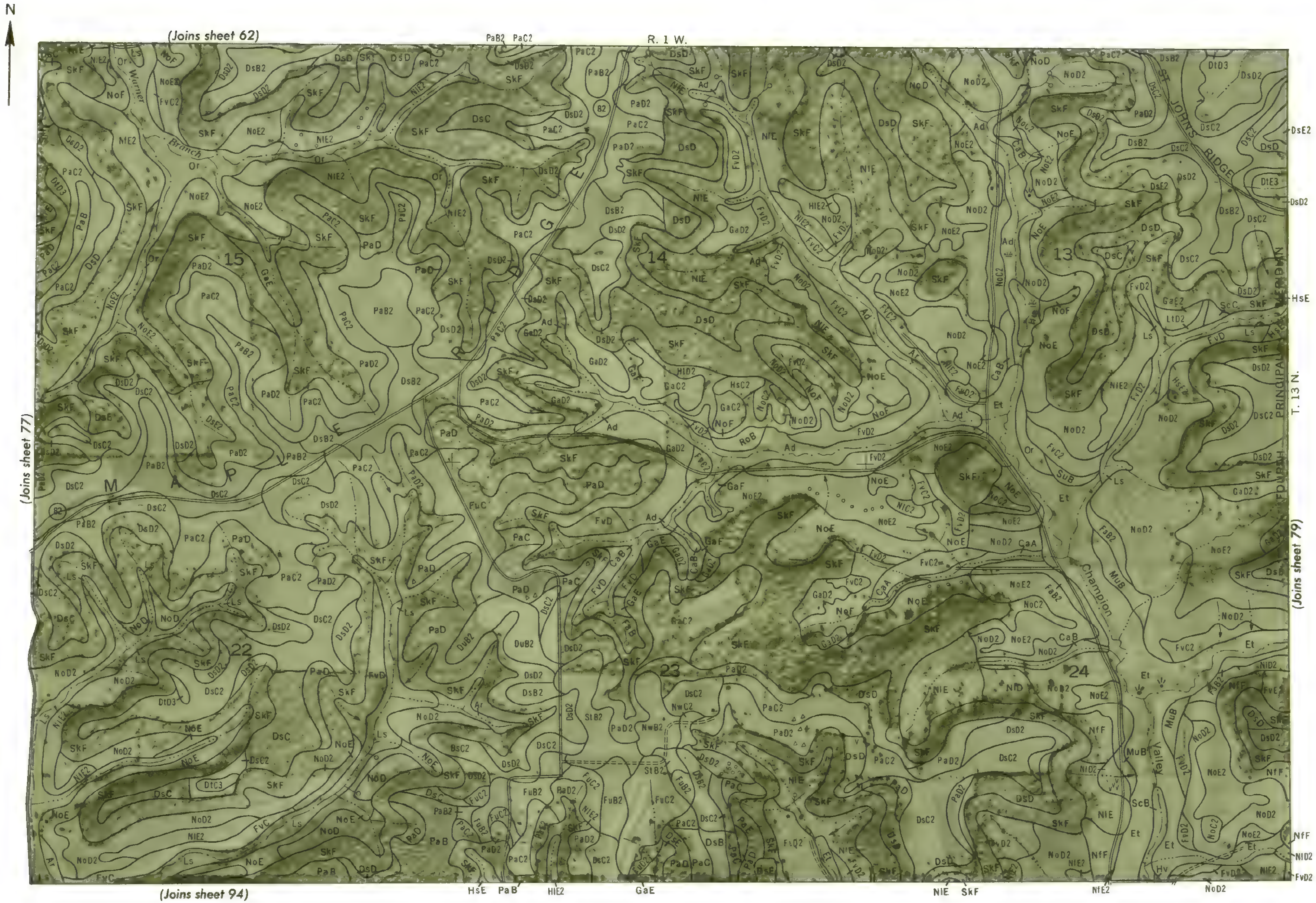


0 ½ Mile Scale 1:15840 0 3000 Feet

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 77

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 78

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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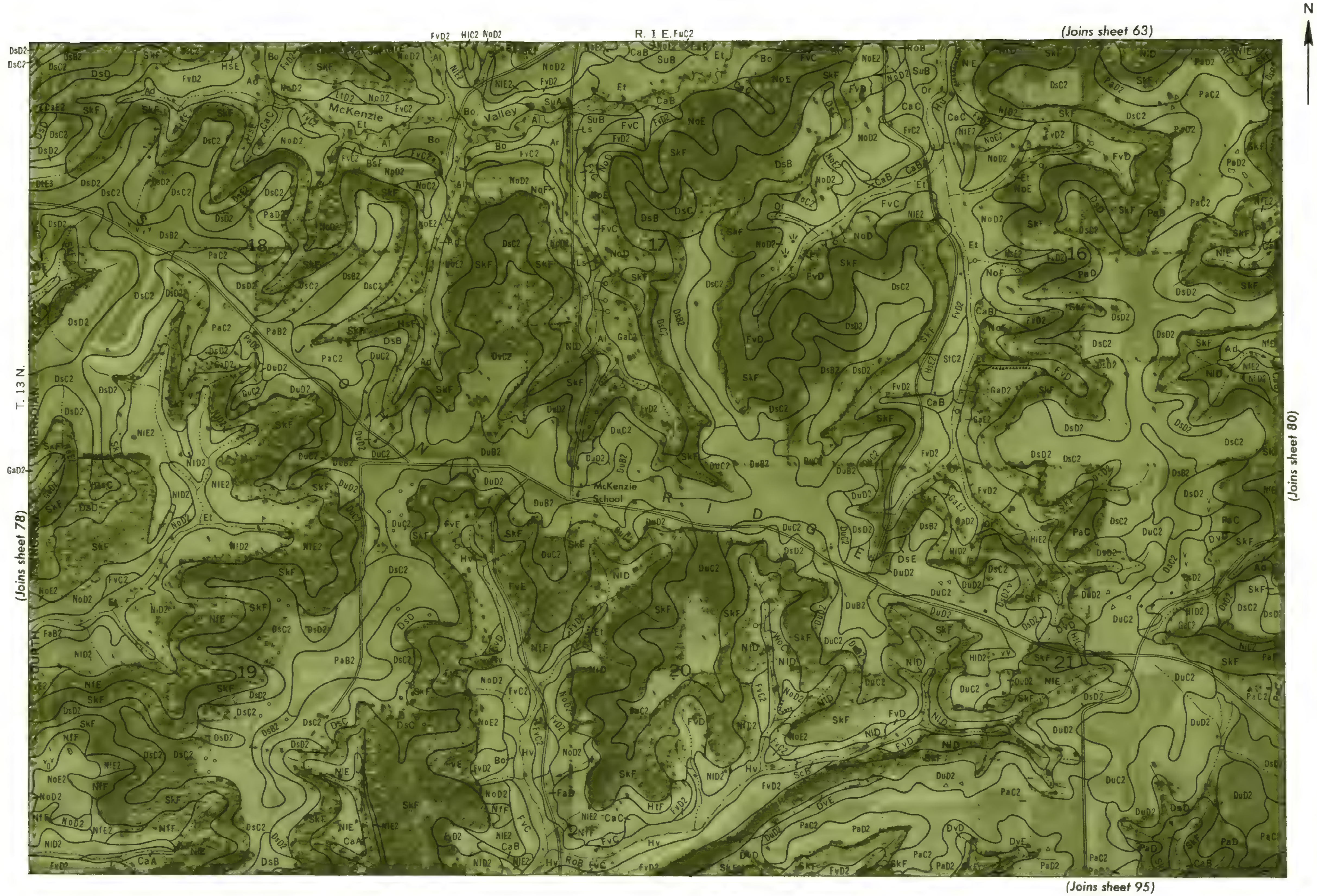
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 79



0 ½ Mile Scale 1:15840 0 3000 Feet

N

(Joins sheet 64)

(Joins sheet 96)

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 80

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station

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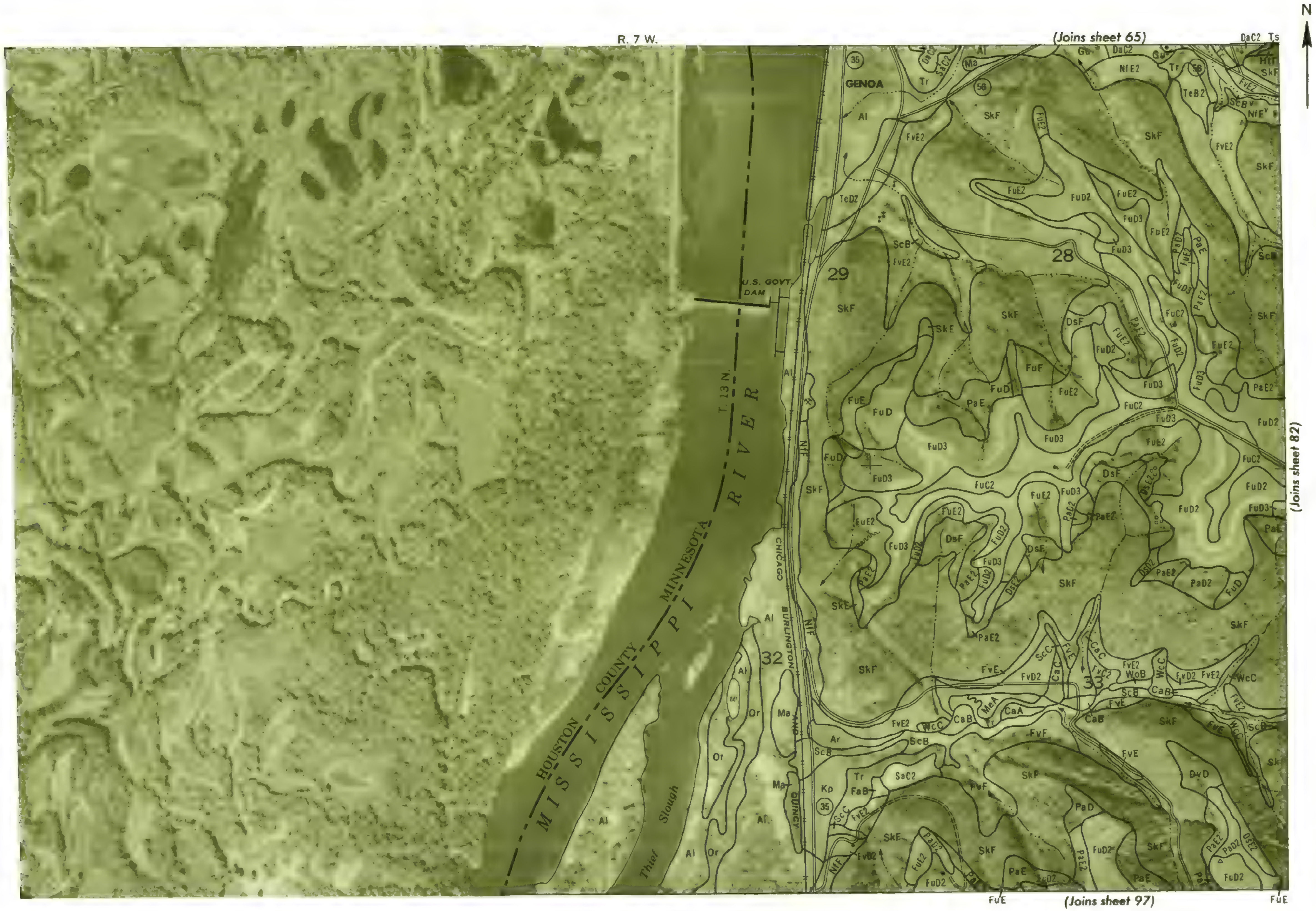
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 81



0 ½ Mile Scale 1:15840 0 3000 Feet

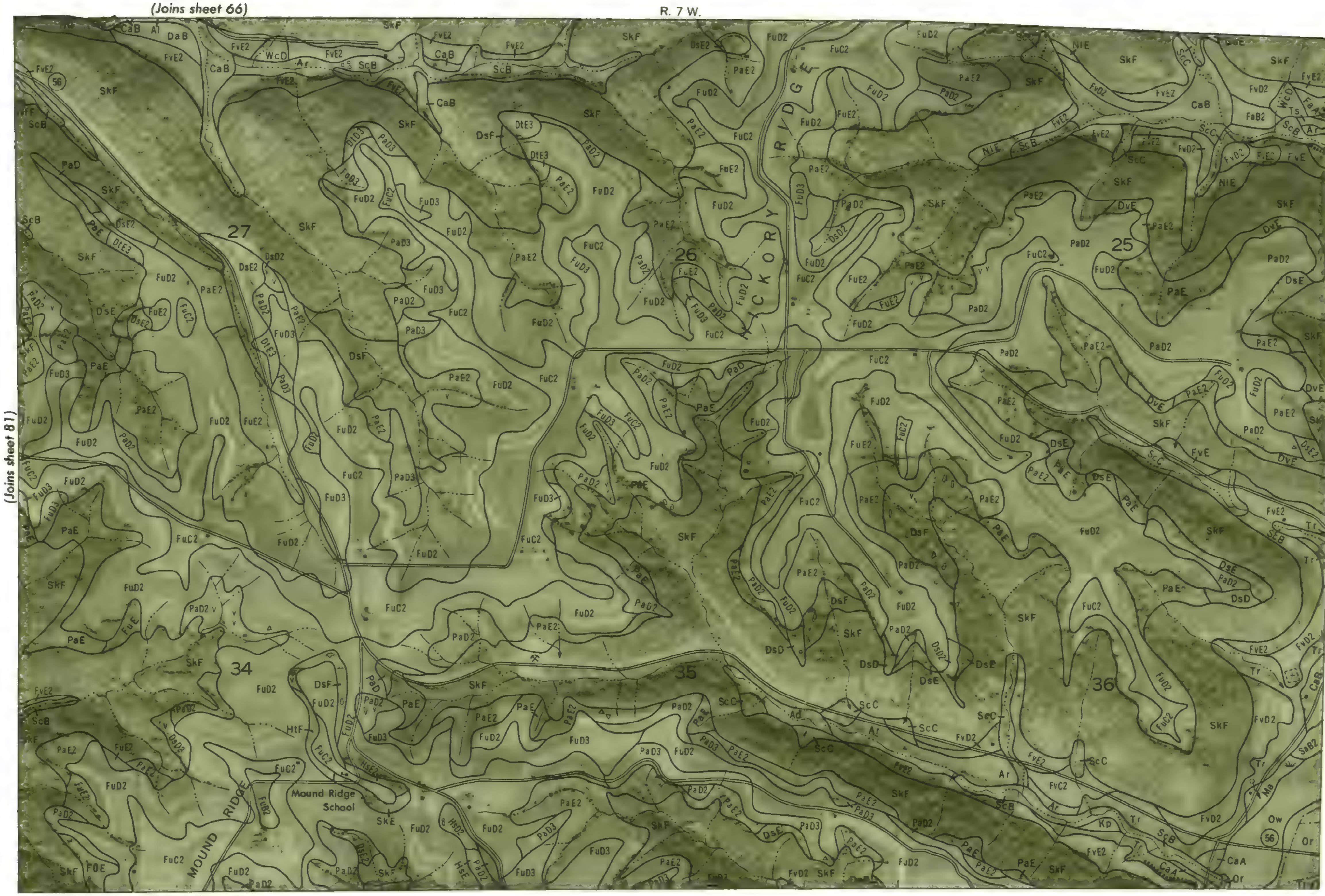
82

N

(Joins sheet 66)

R. 7 W.

(Joins sheet 81)



T. 13 N.

(Joins sheet 83)

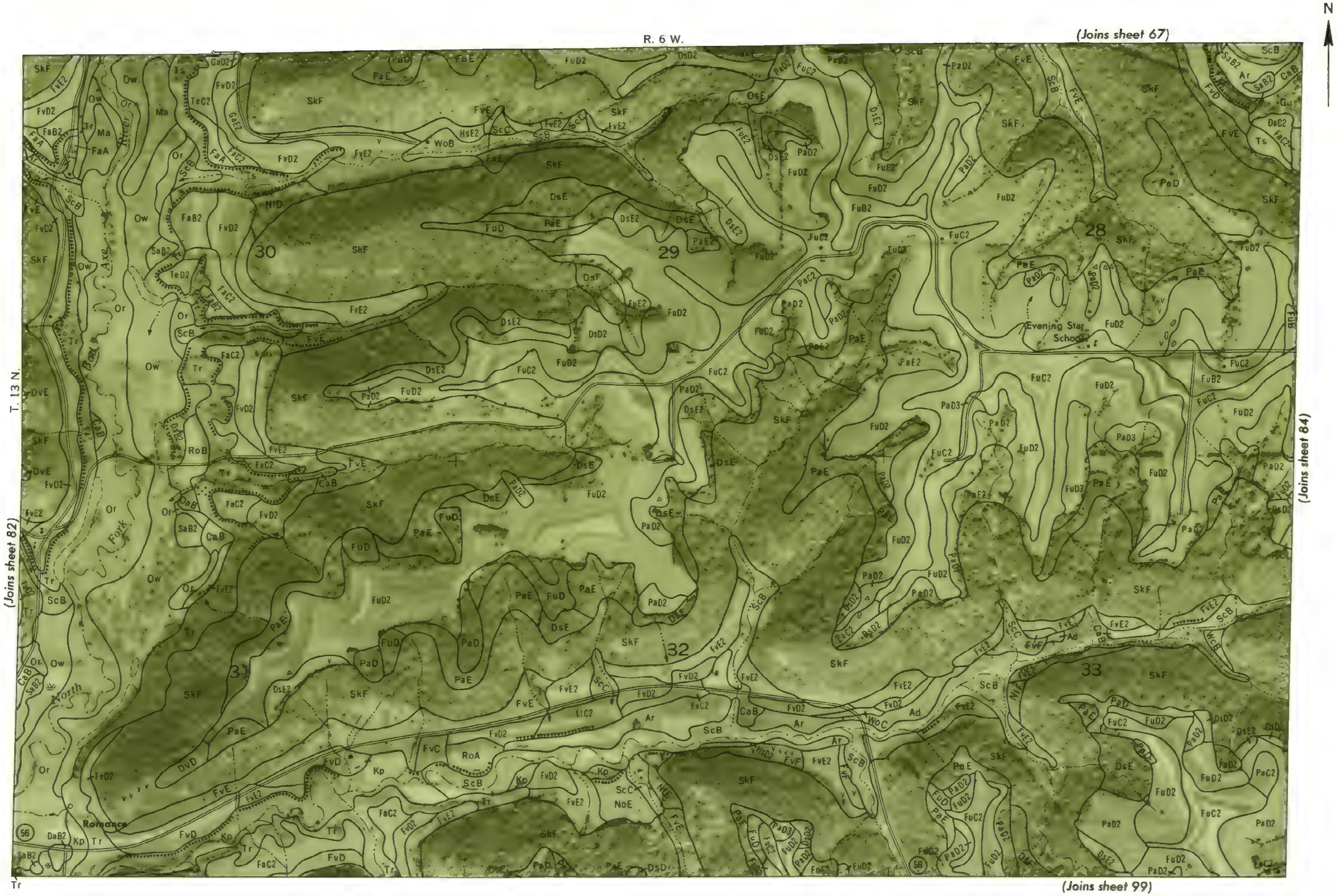
(Joins sheet 98)

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 82

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

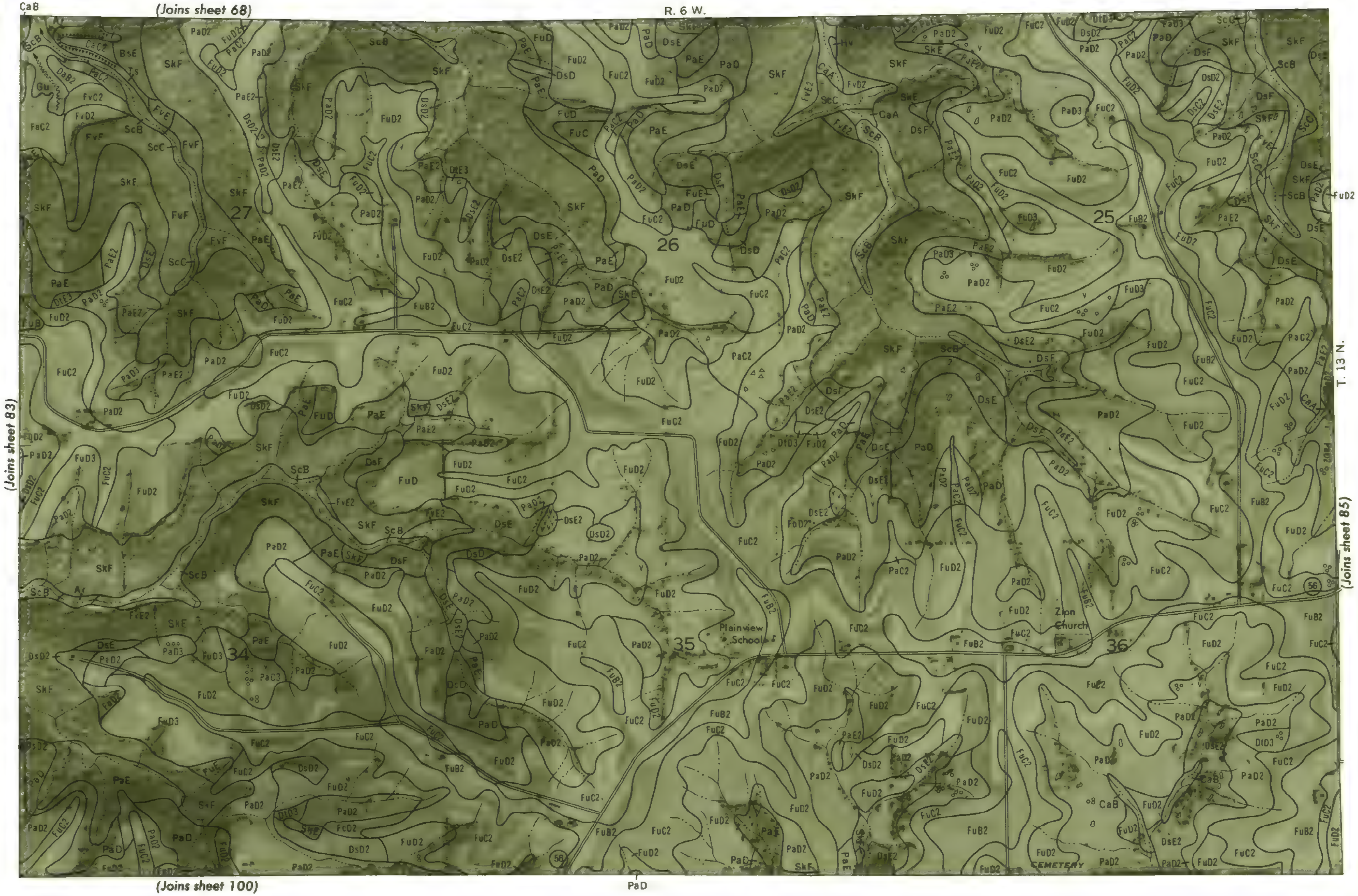


0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

N

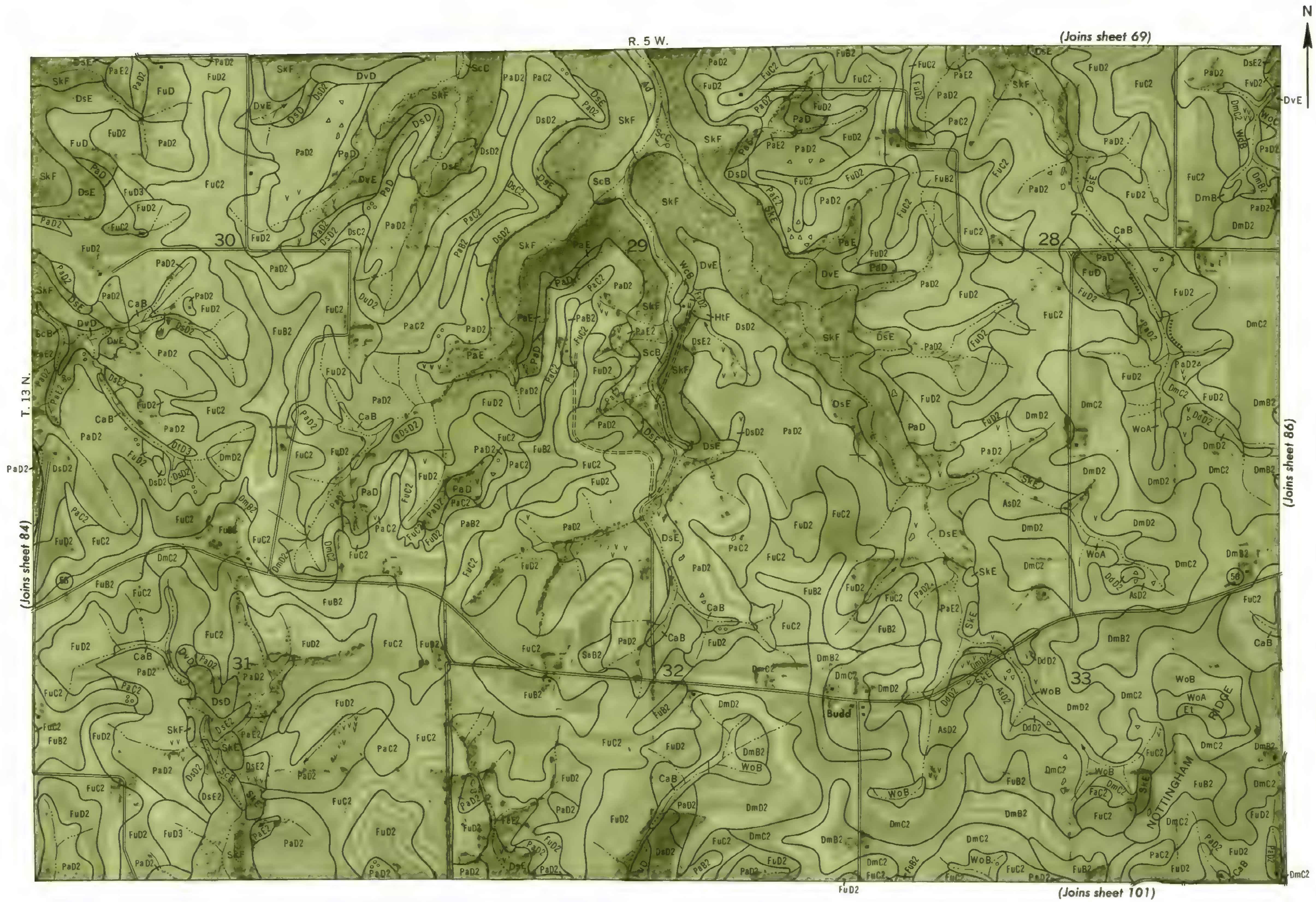


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 84

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



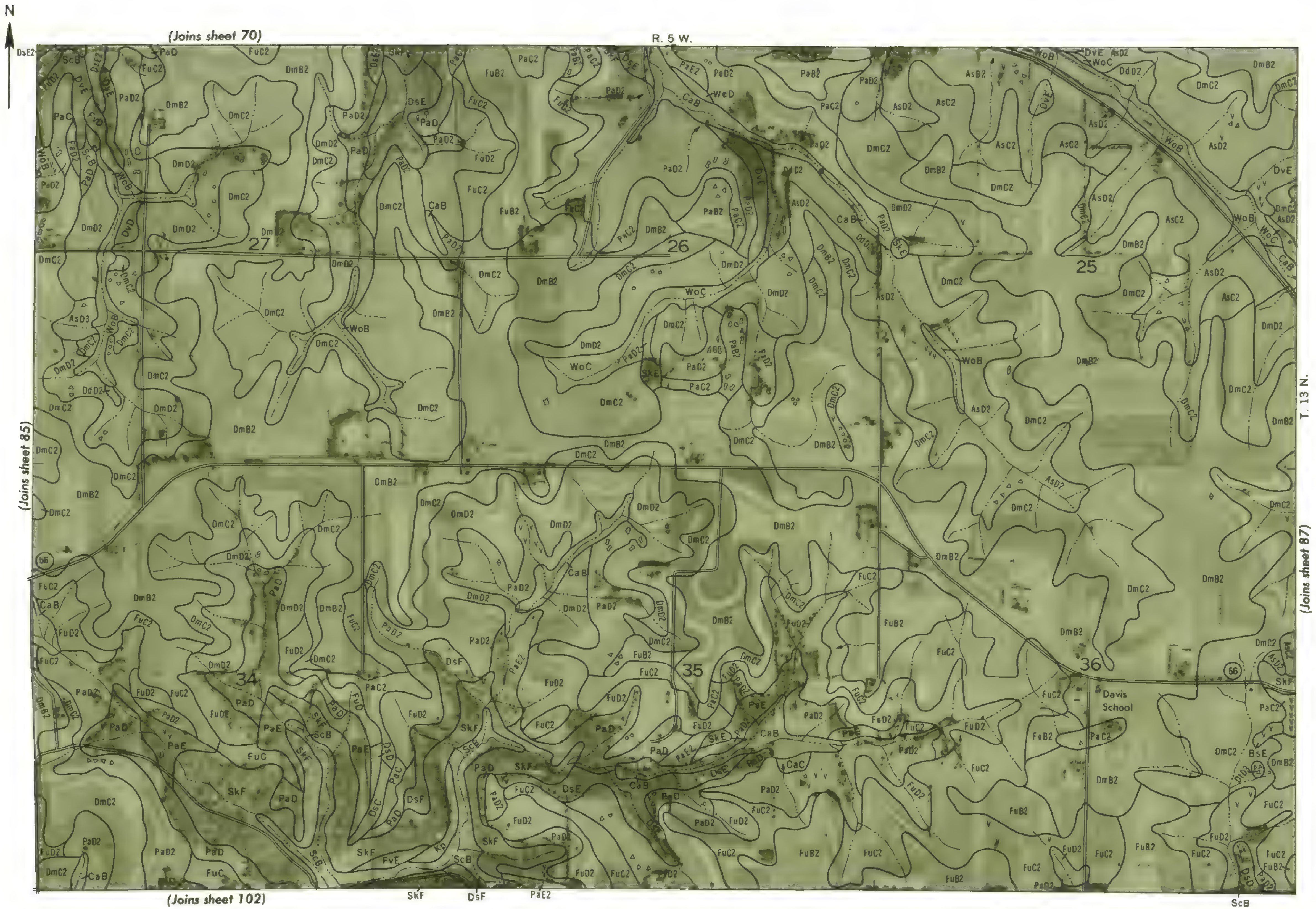
0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 85

VERNON COUNTY, WISCONSIN — SHEET NUMBER 86



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 86

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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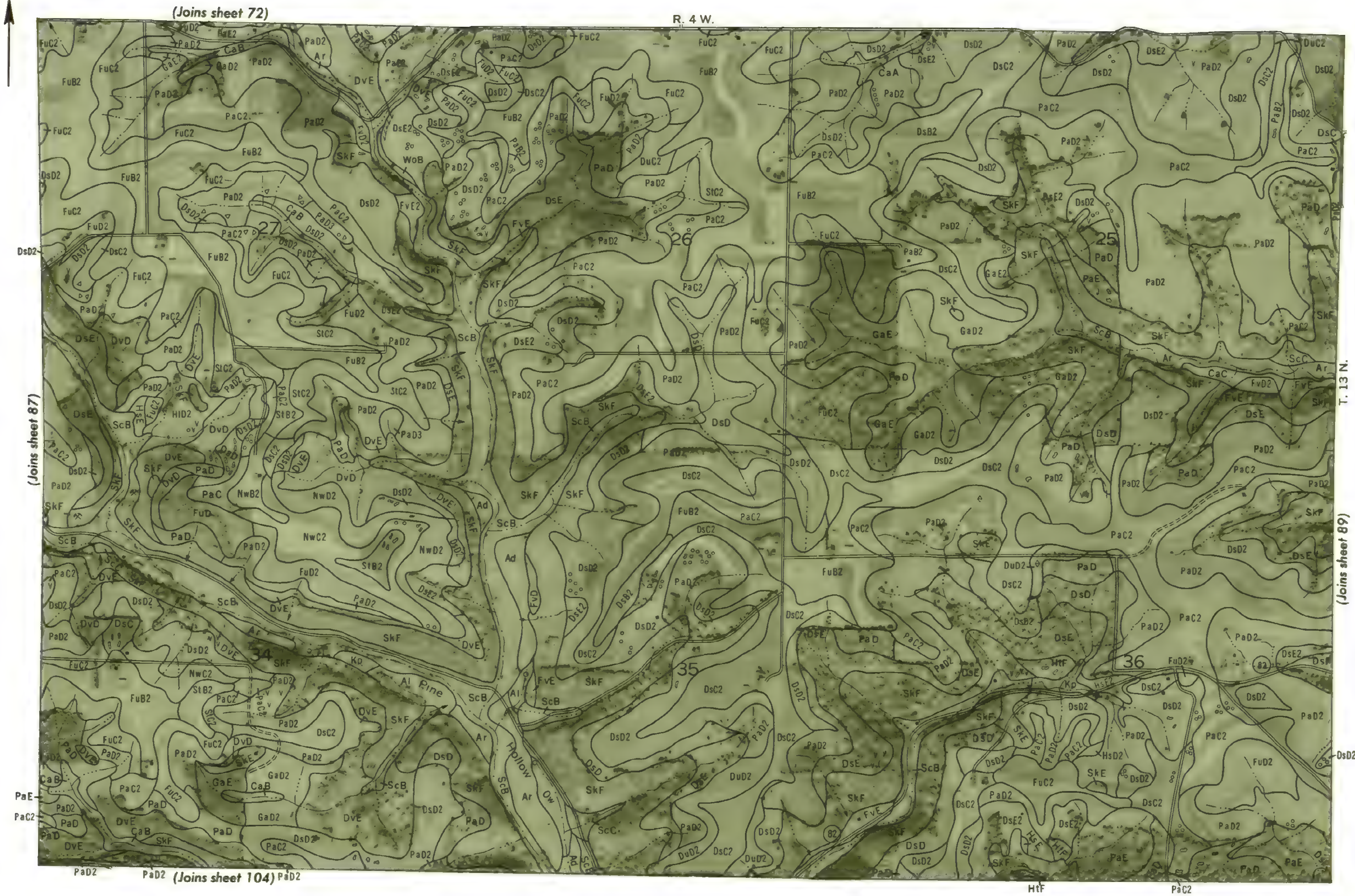
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 87

0 ½ Mile Scale 1:15 840 0 3000 Feet

N

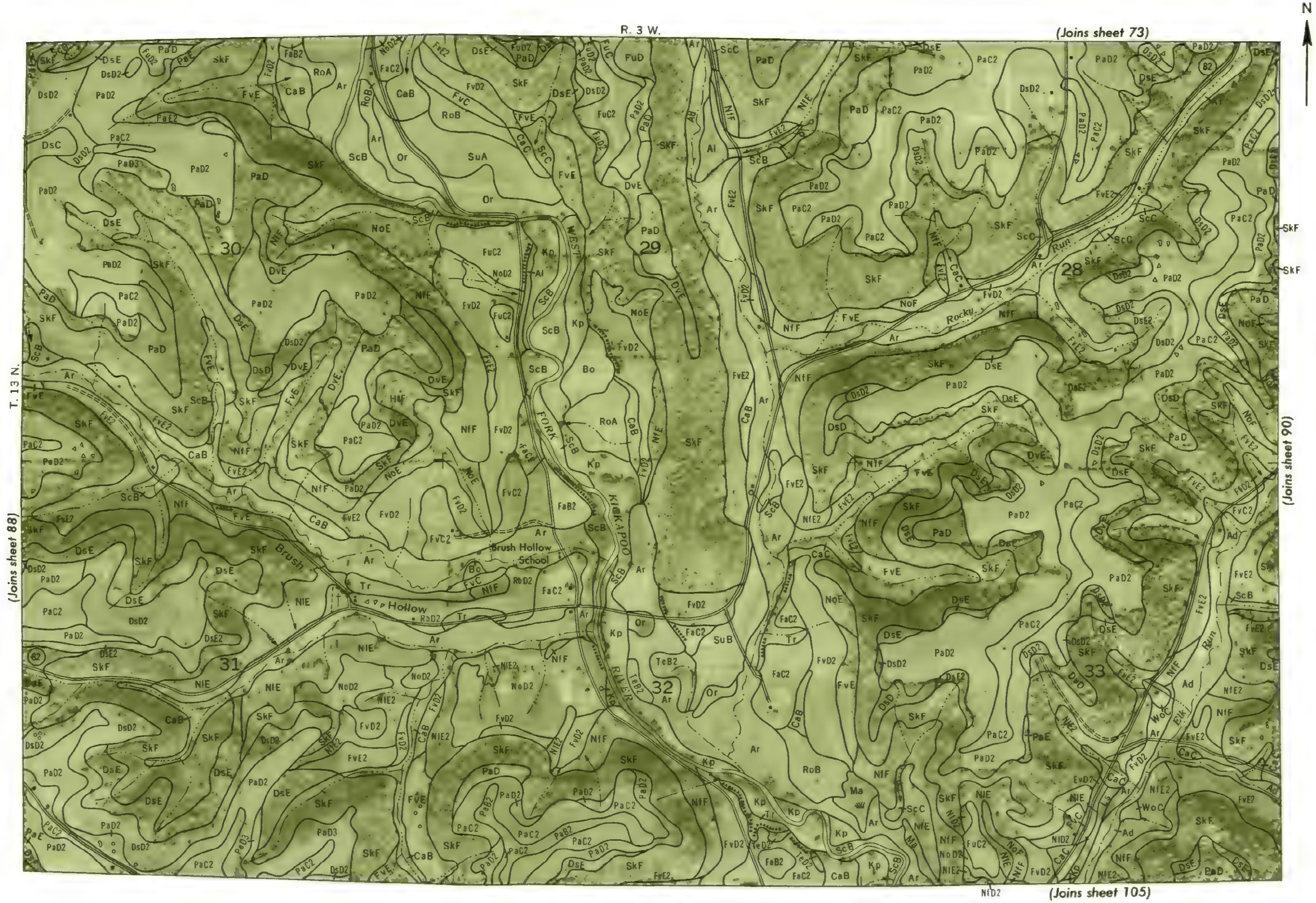


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 88

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

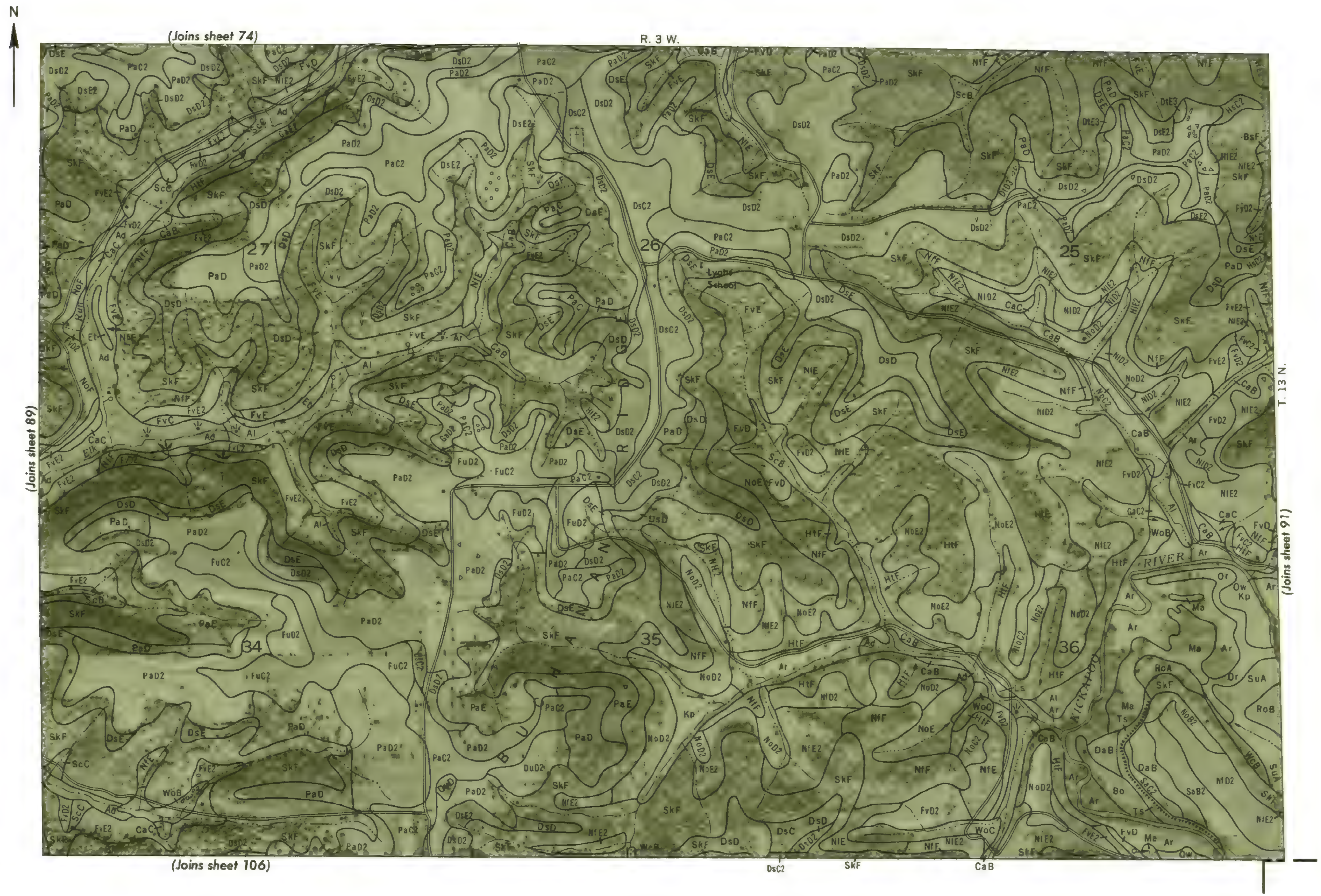


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 89

Land division corners are approximately positioned on this map.

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

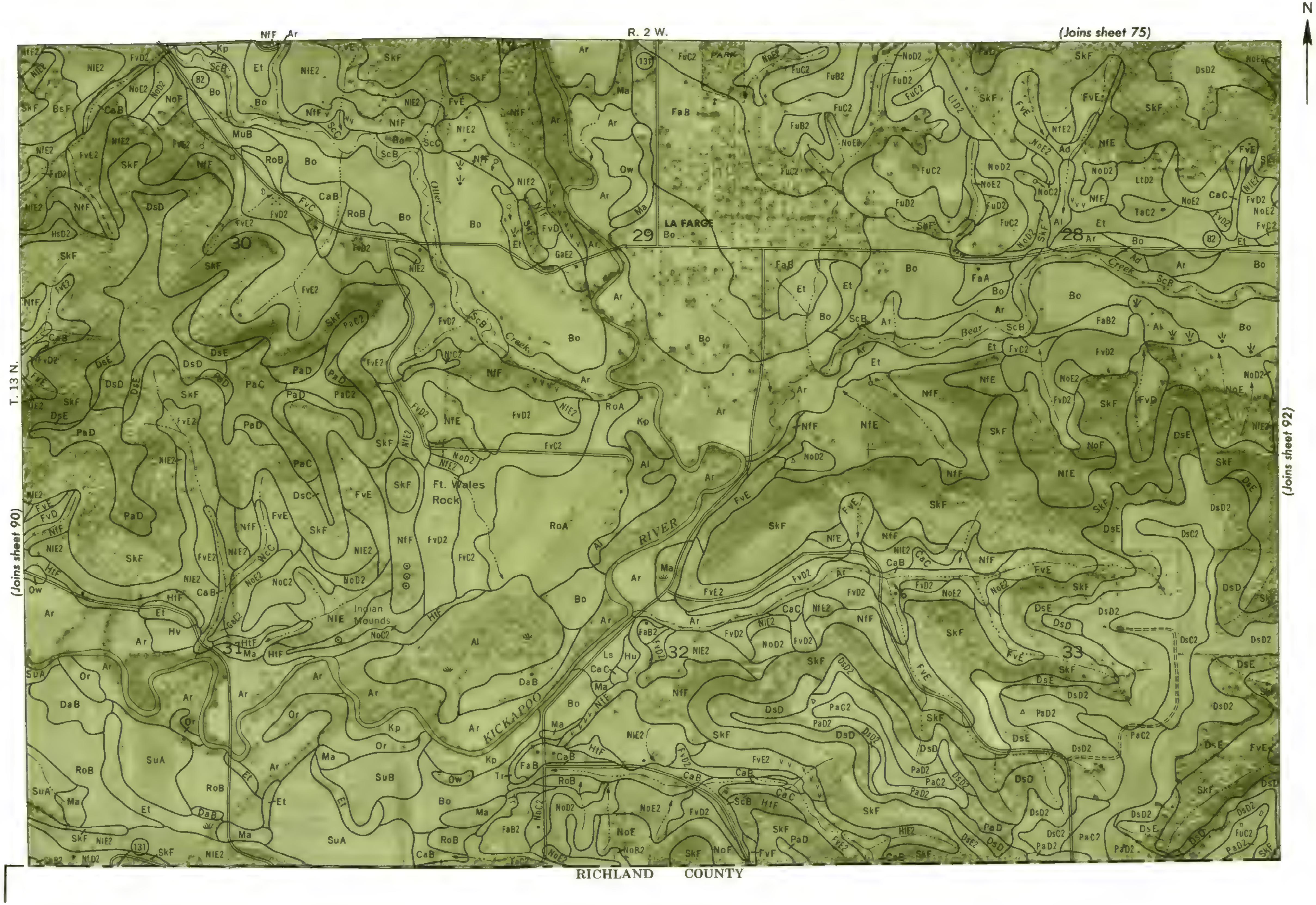


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 90

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

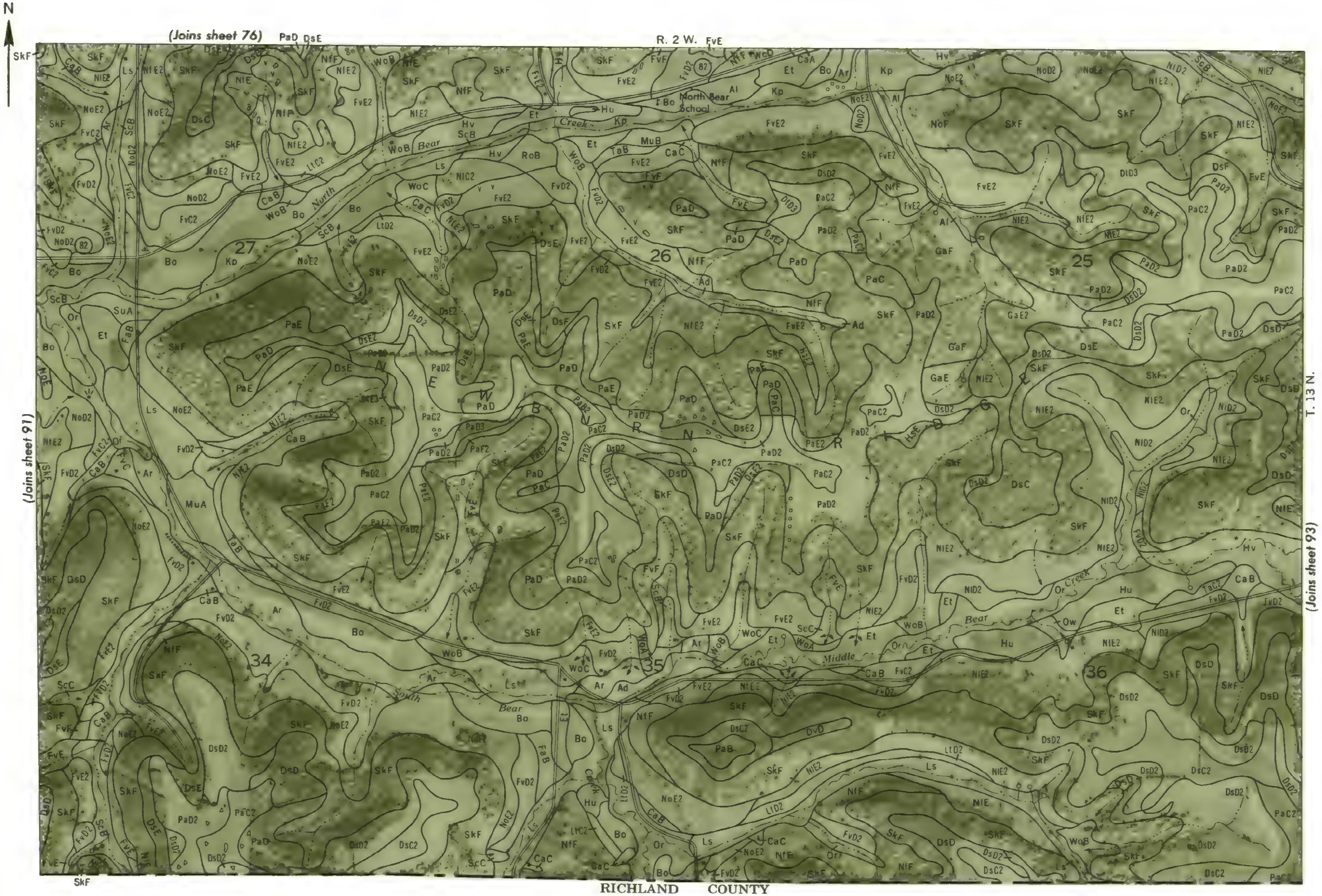


0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 91

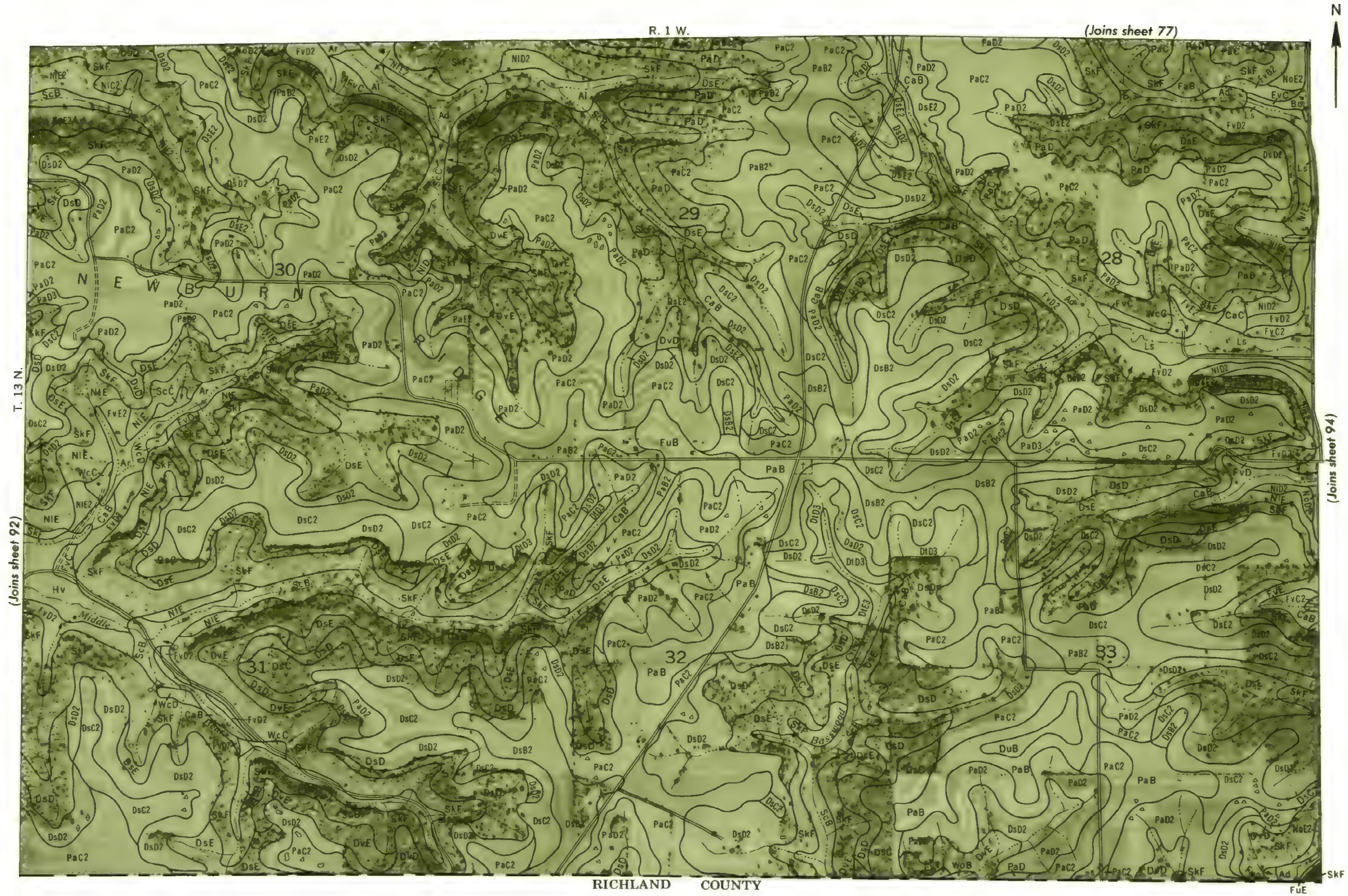


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 92

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



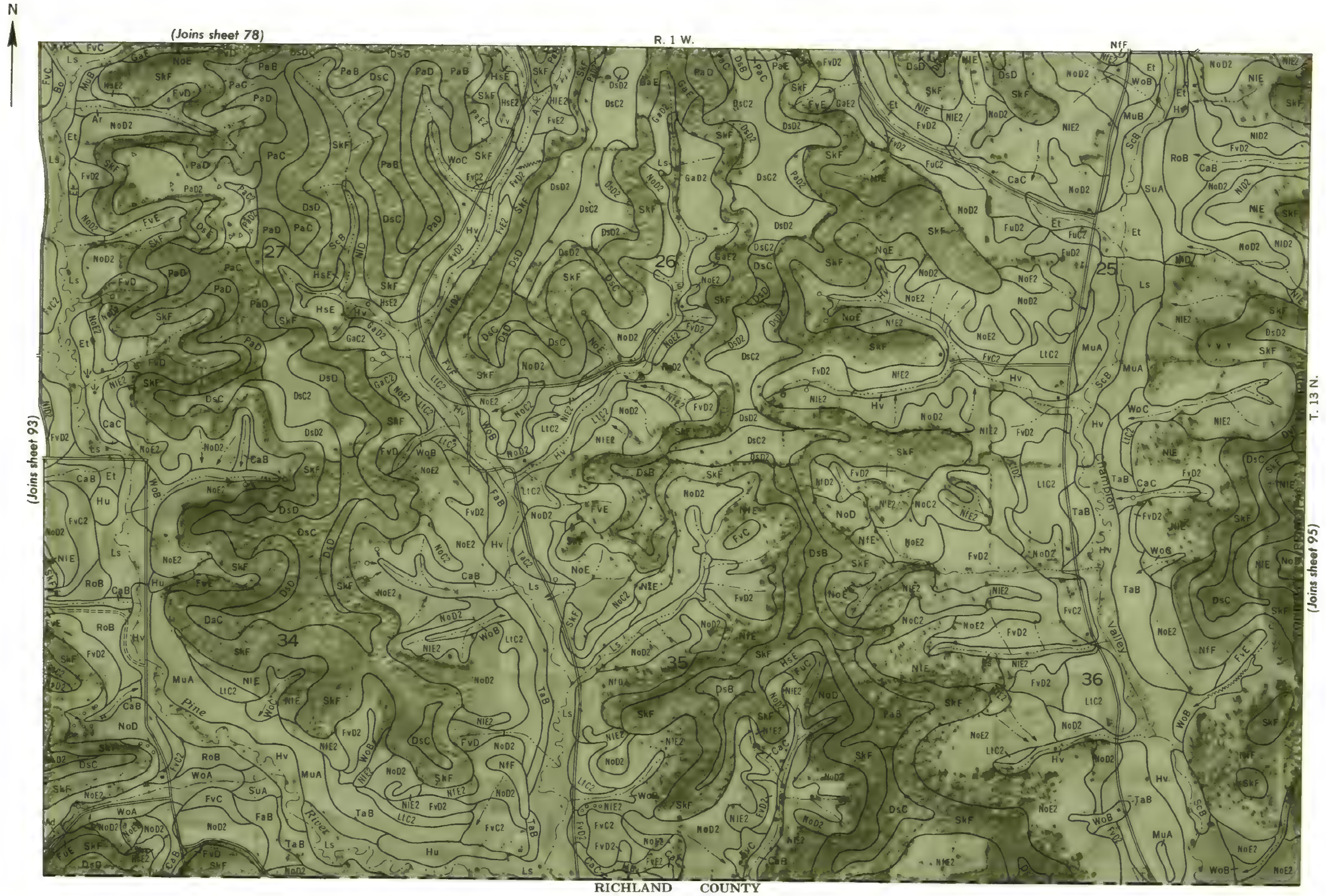
This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 93

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 94



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 94

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

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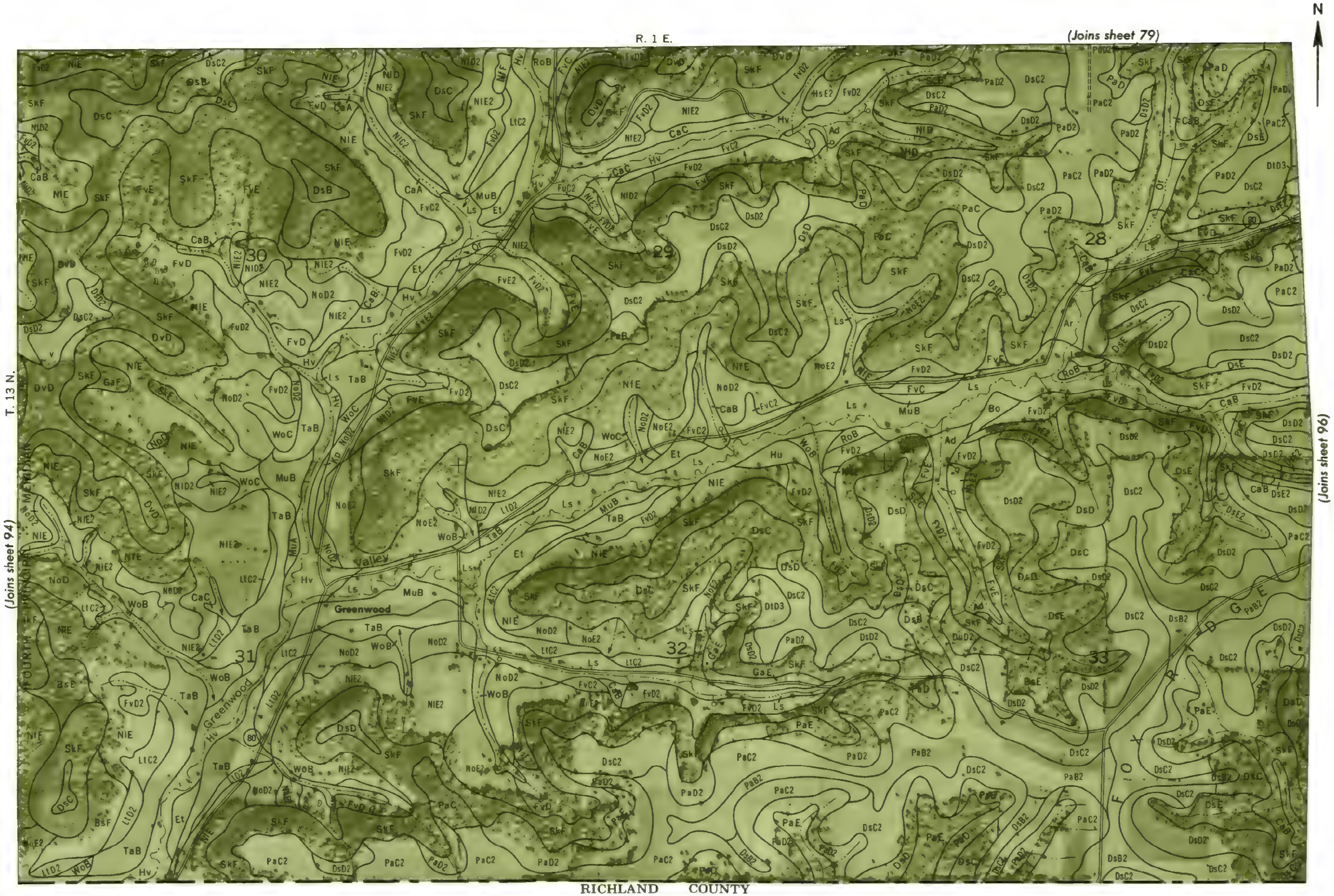
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 95



0 ½ Mile Scale 1:15840 0 3000 Feet

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 96

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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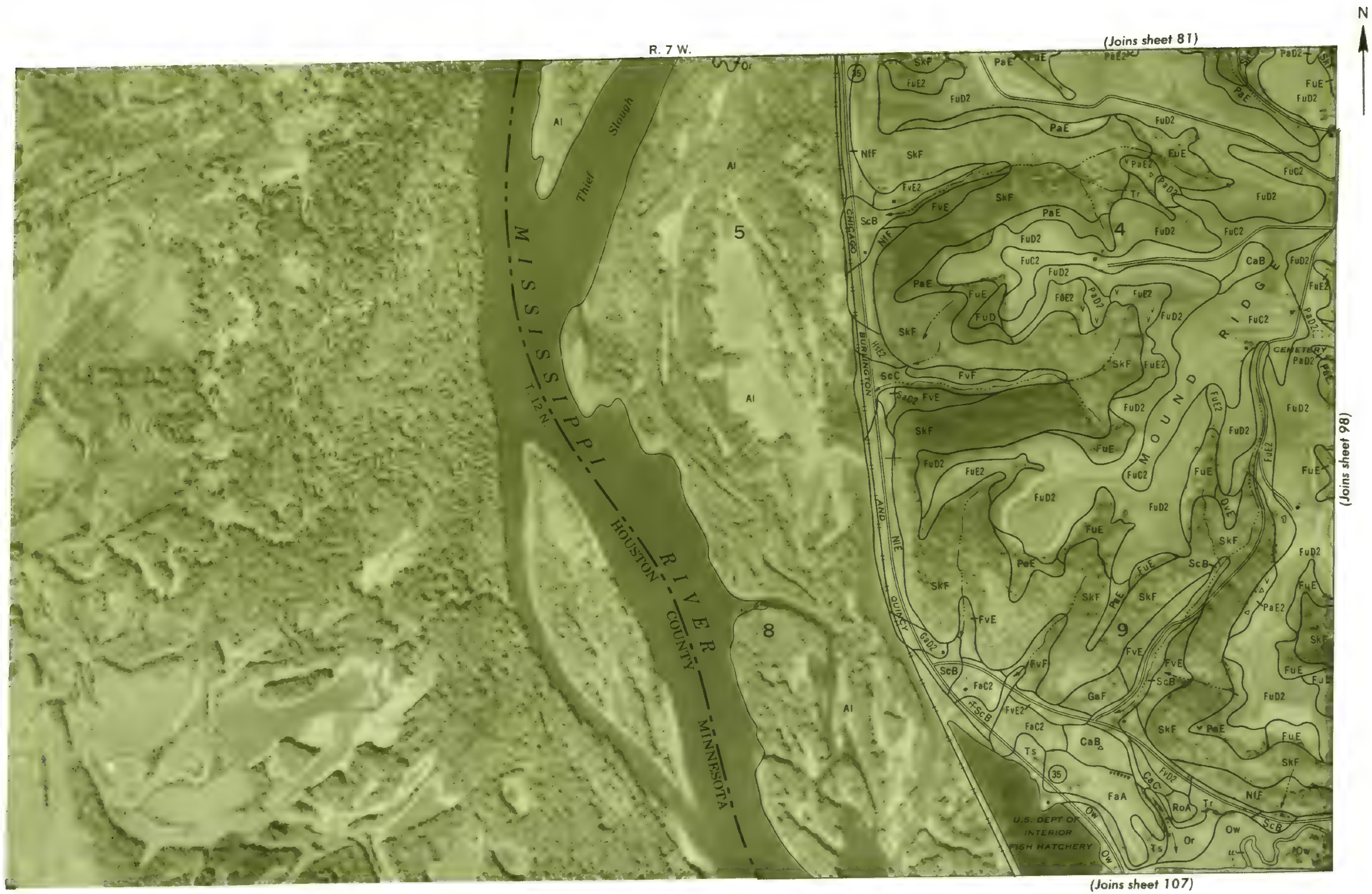
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 97



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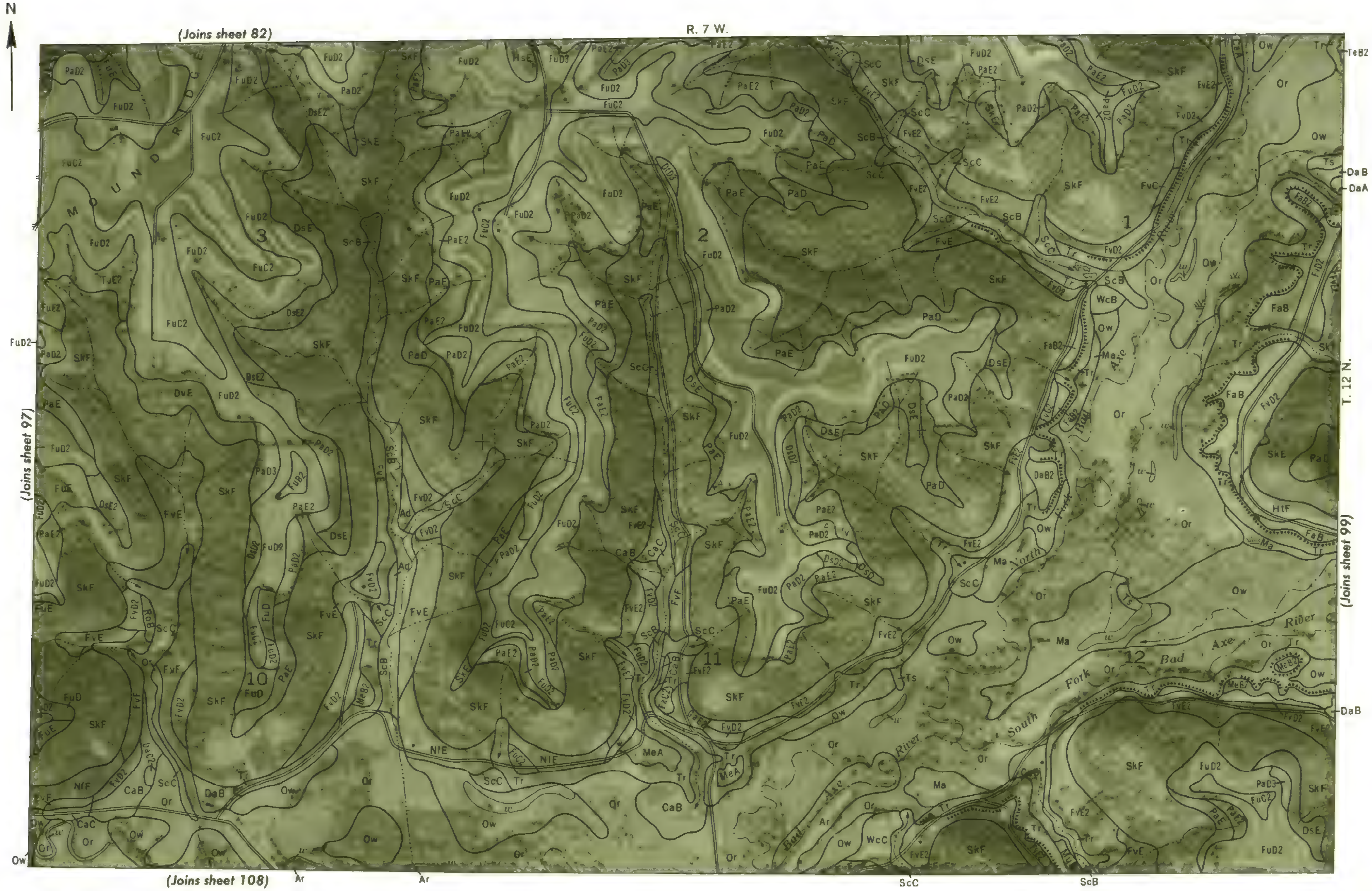


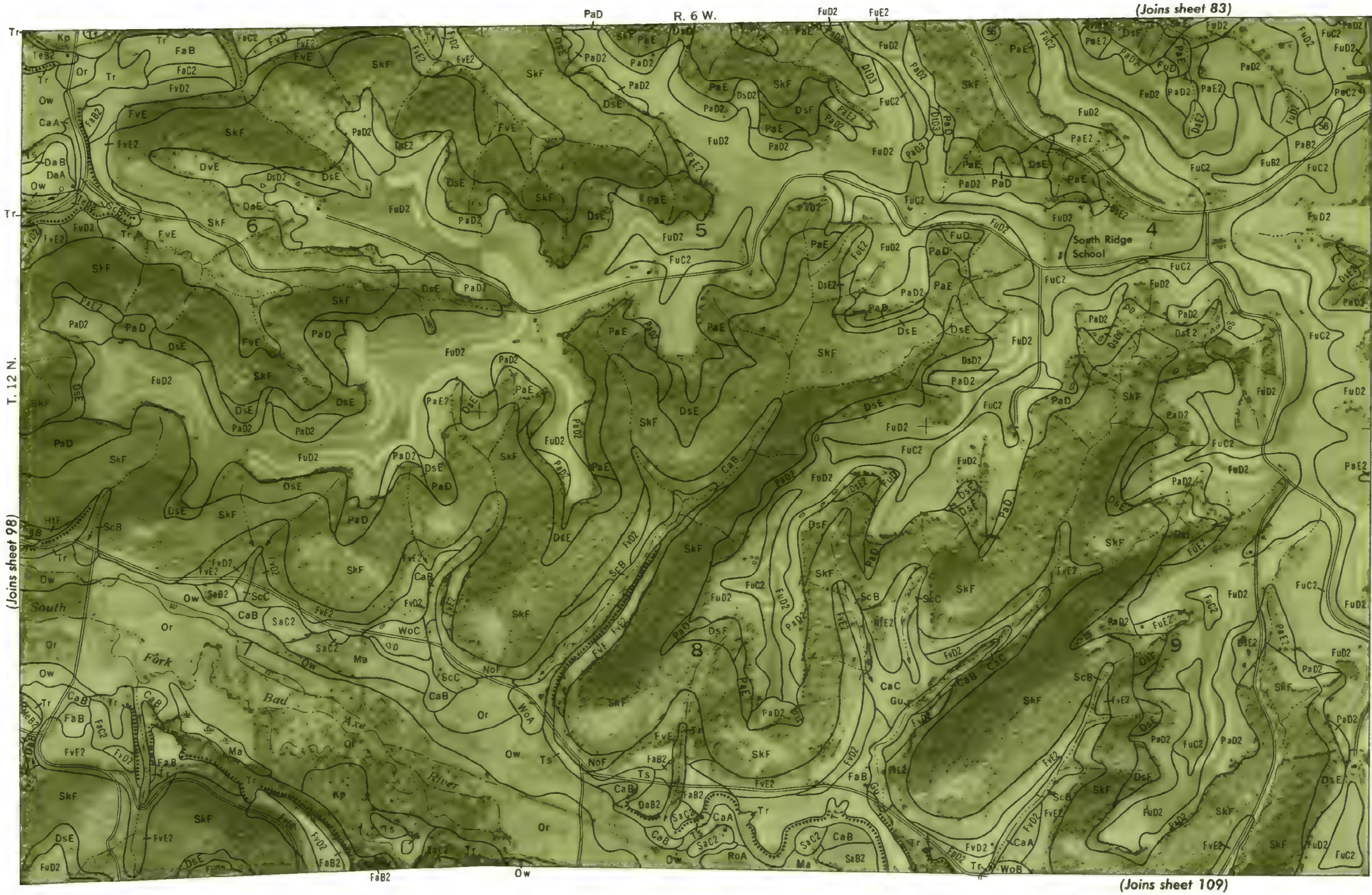
0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 98

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

N



0 ½ Mile Scale 1:15840 0 3000 Feet

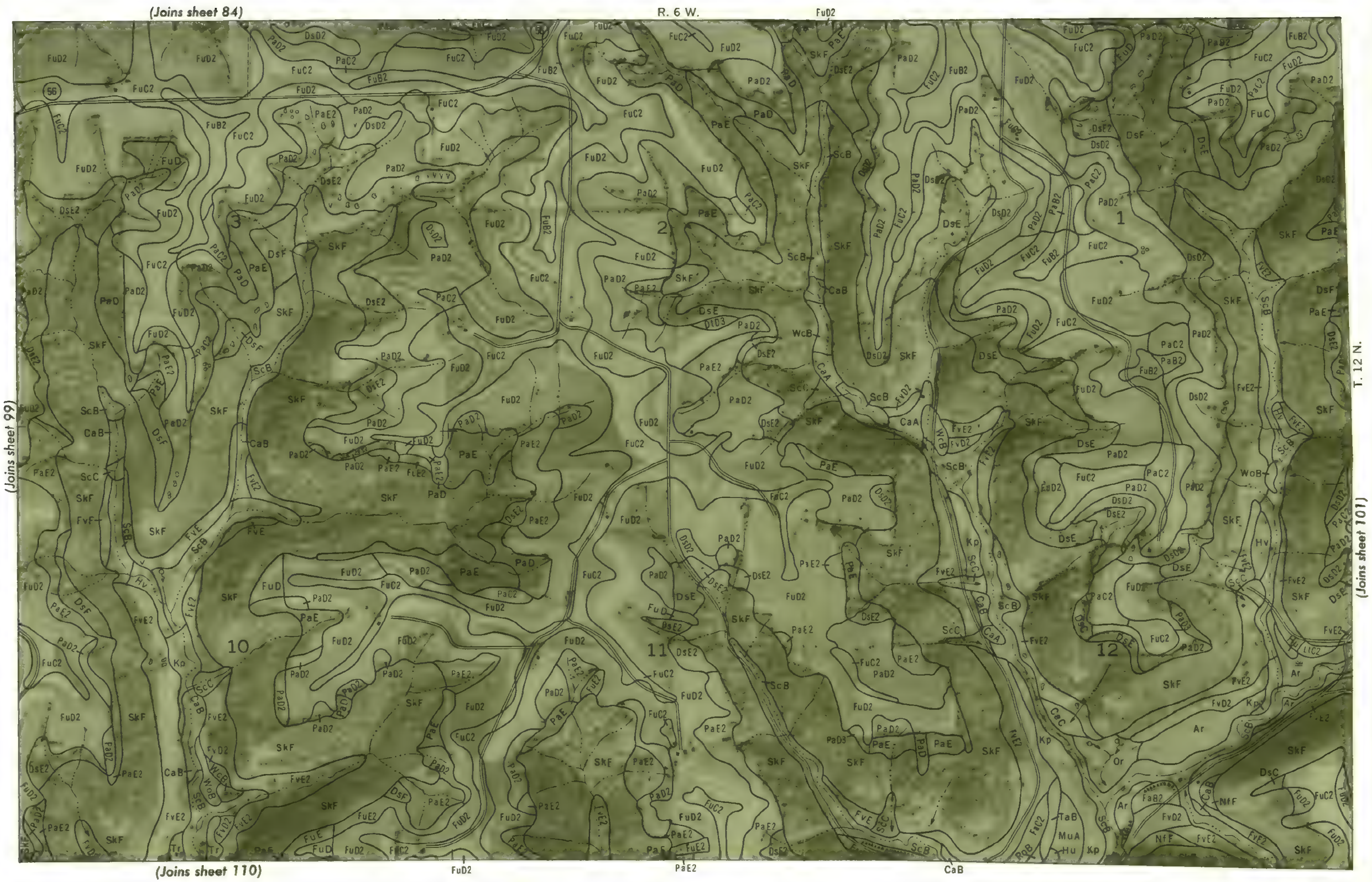
VERNON COUNTY, WISCONSIN NO. 99

Land division corners are approximately positioned on this map.

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

(100)

N

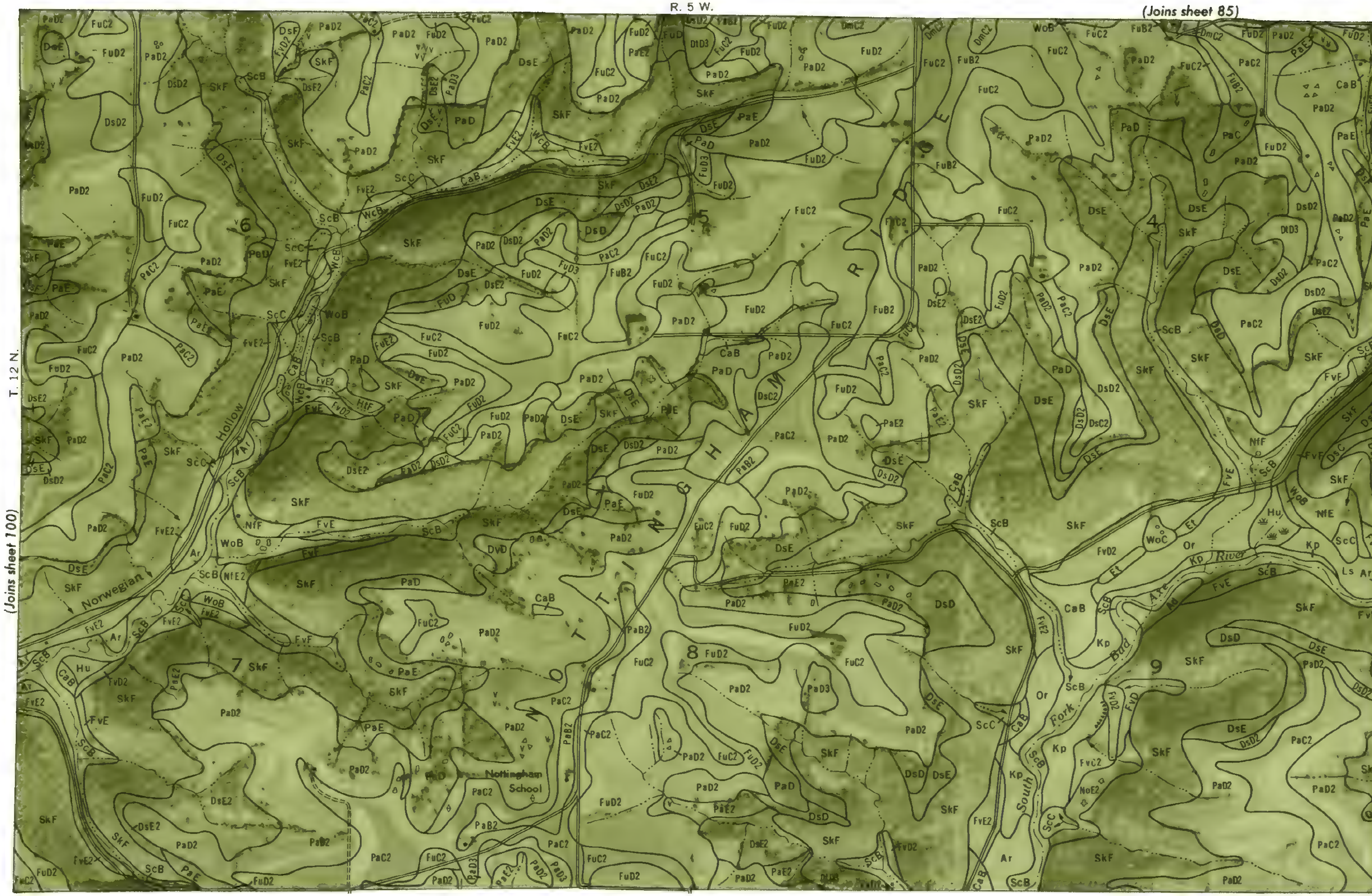


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 100

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station

Land division corners are approximately positioned on this map.



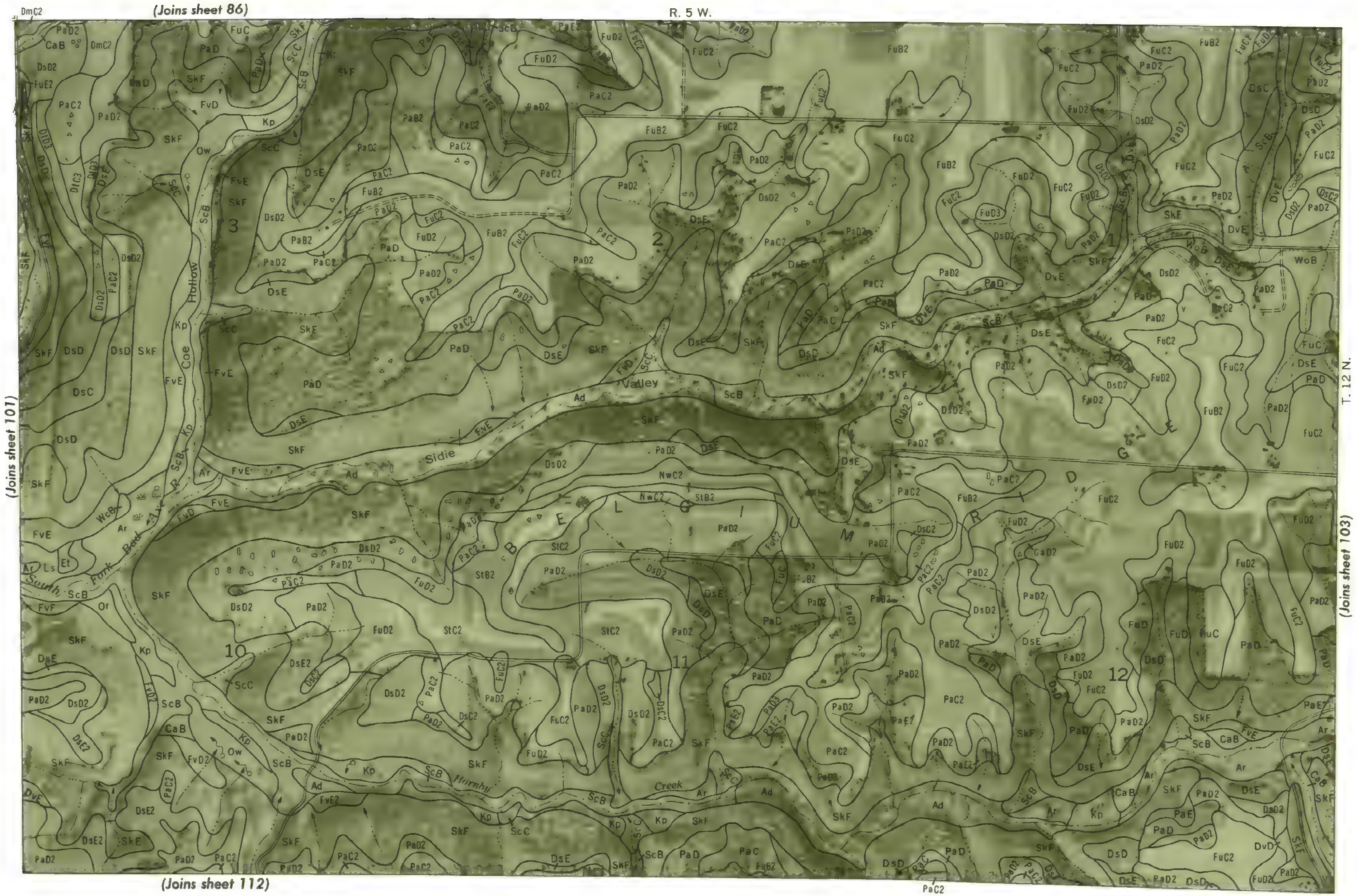
½ Mile Scale 1:15840 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

102

N

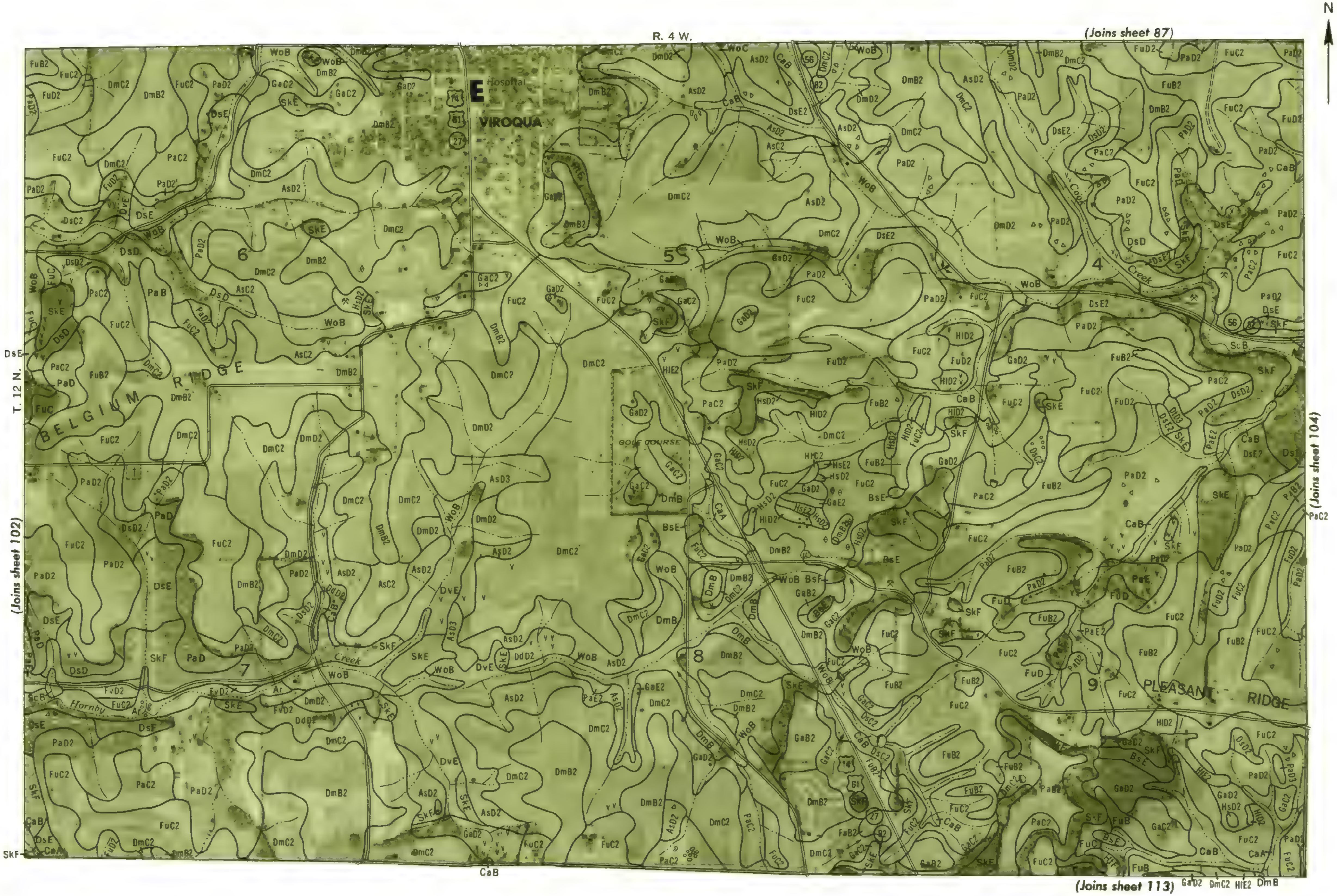


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 102

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 103

VERNON COUNTY, WISCONSIN — SHEET NUMBER 104

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 104

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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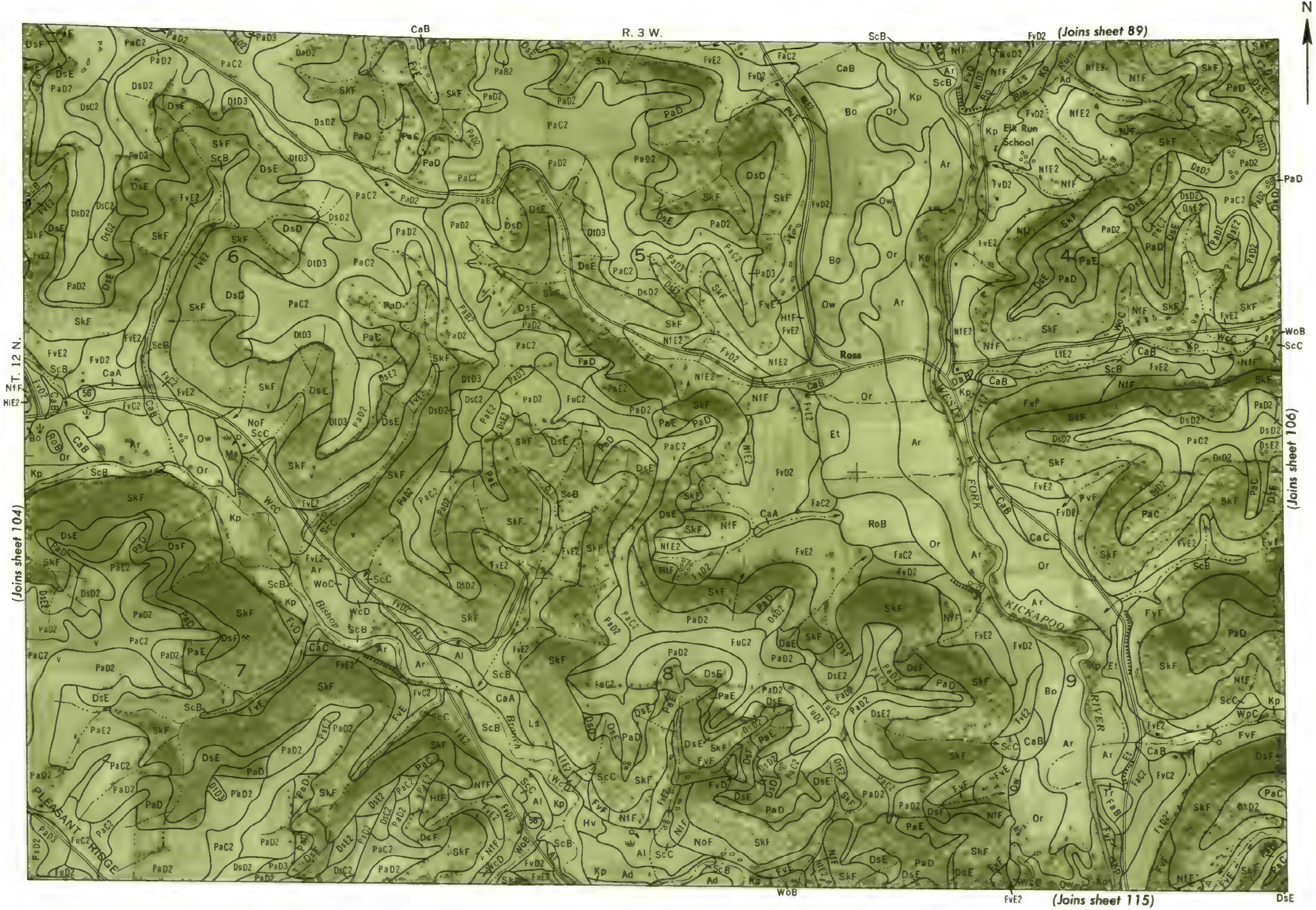
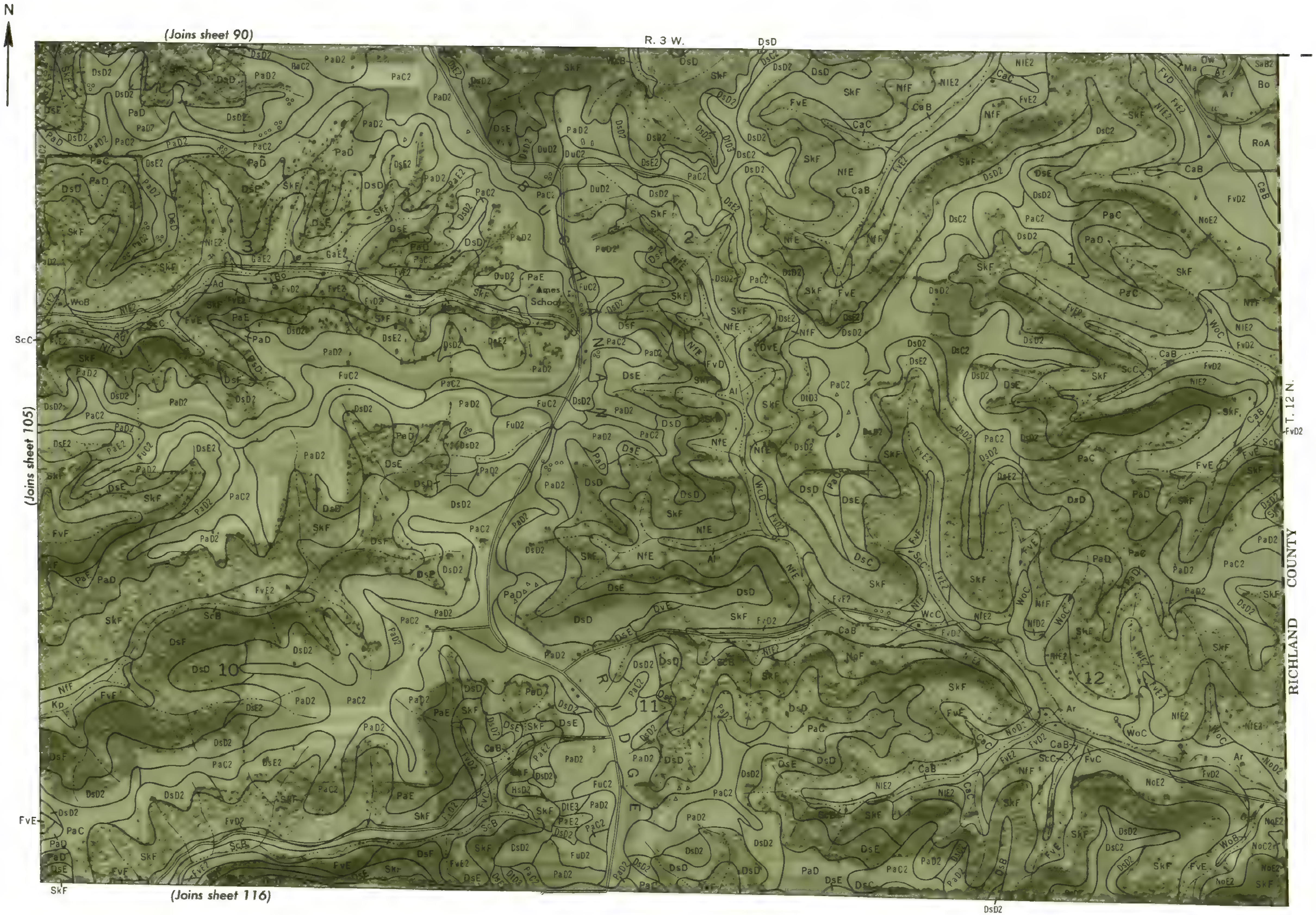


0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN — SHEET NUMBER 106



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 106

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station

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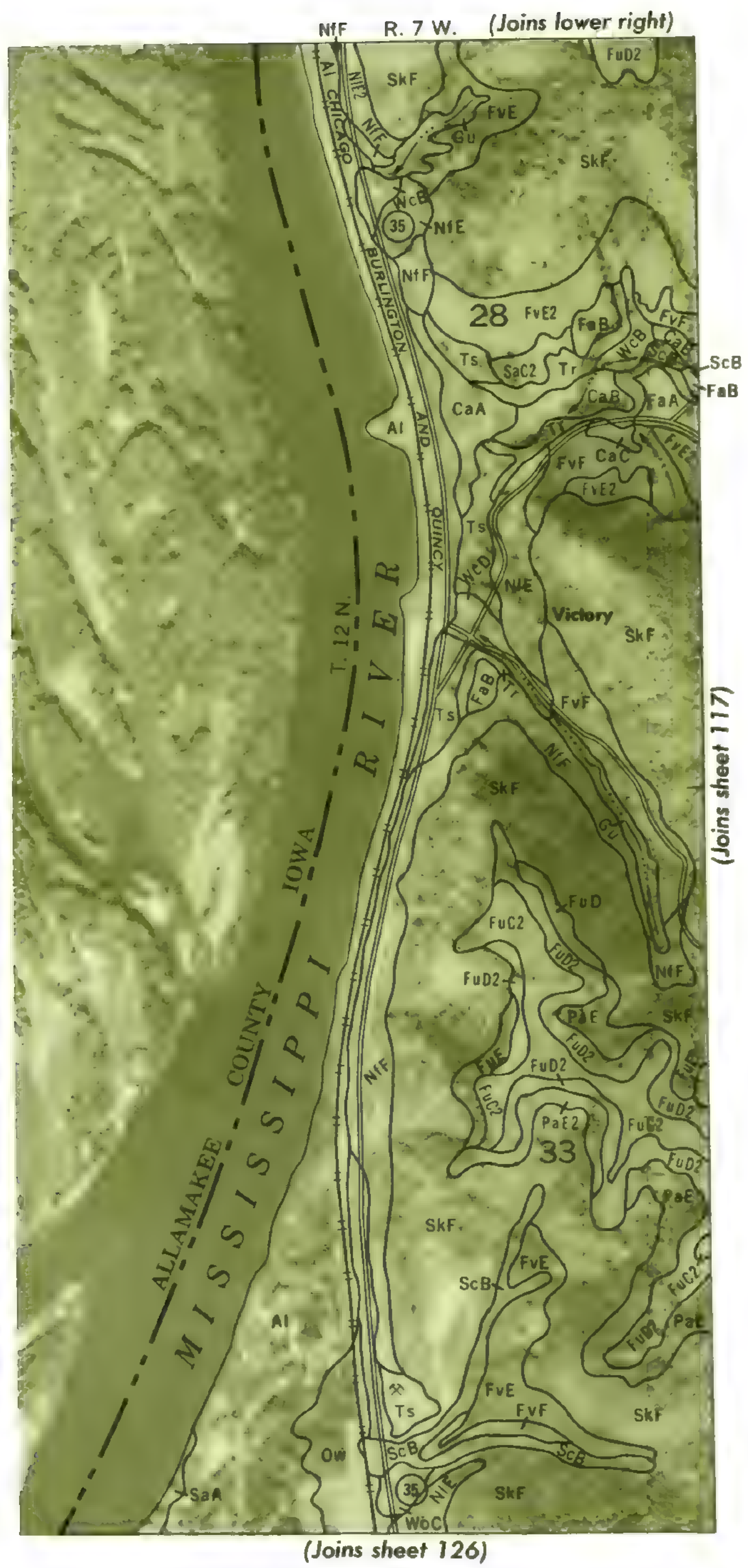
VERNON COUNTY, WISCONSIN NO. 107

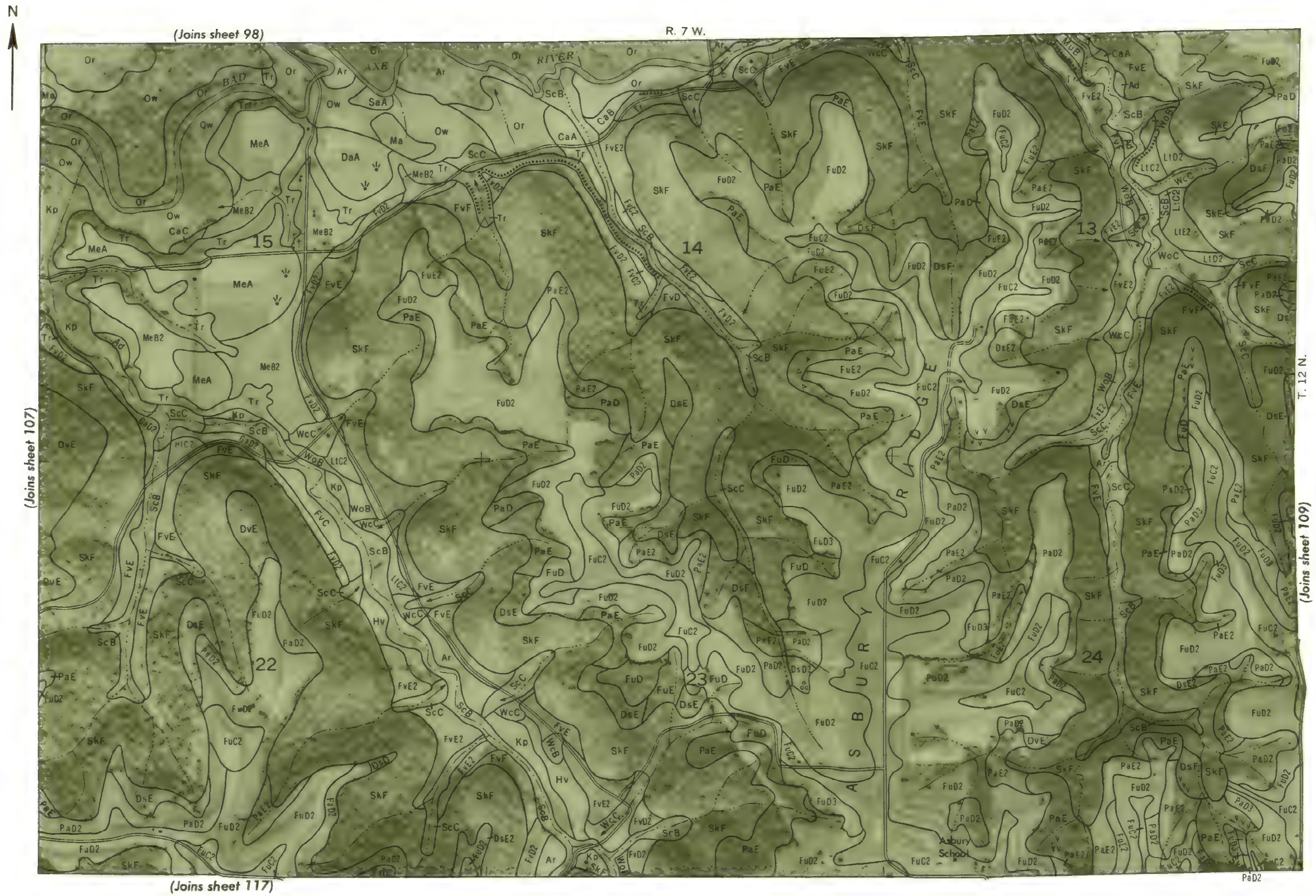
Land division corners are approximately positioned on this map.



N

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 108



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 108

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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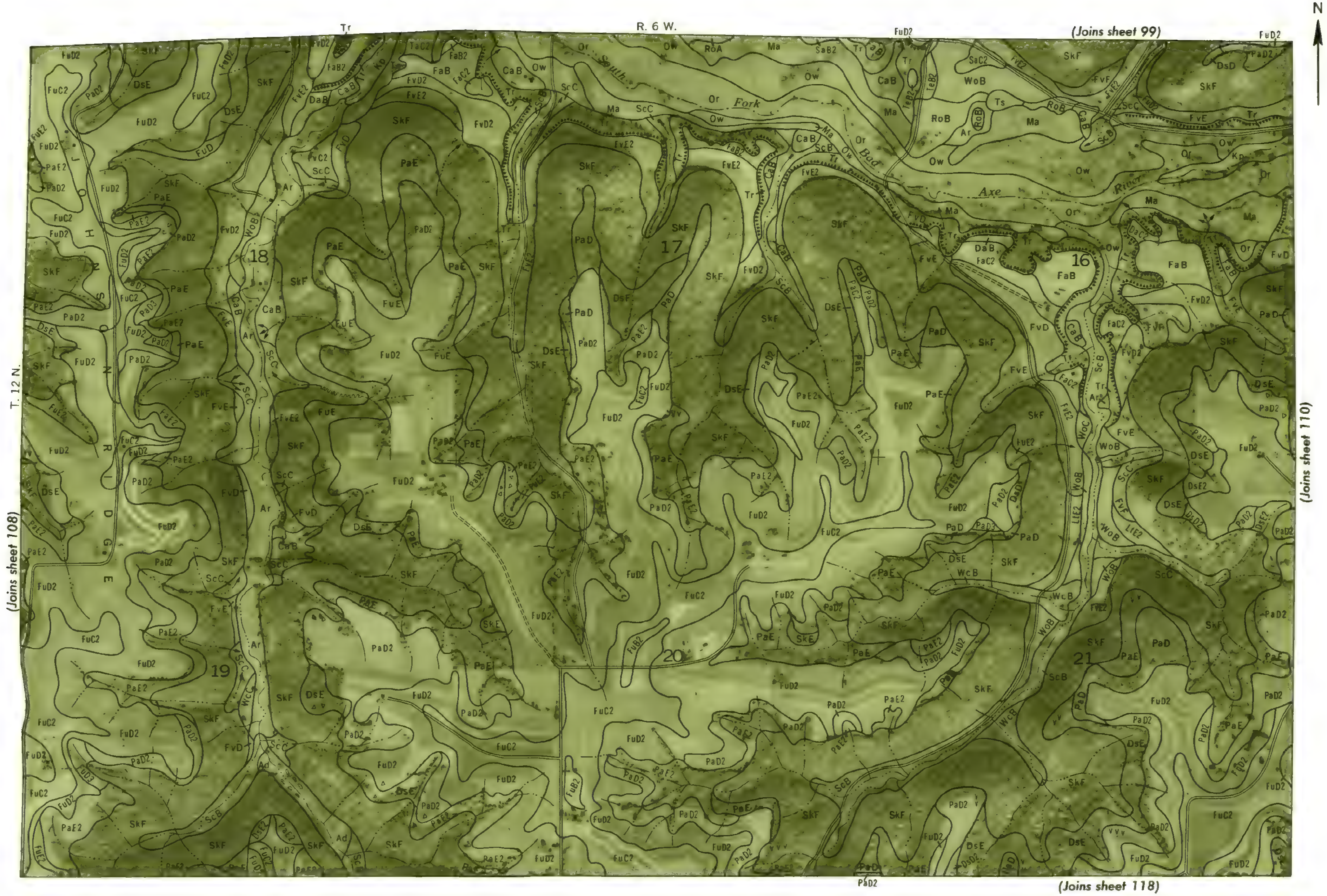
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 109



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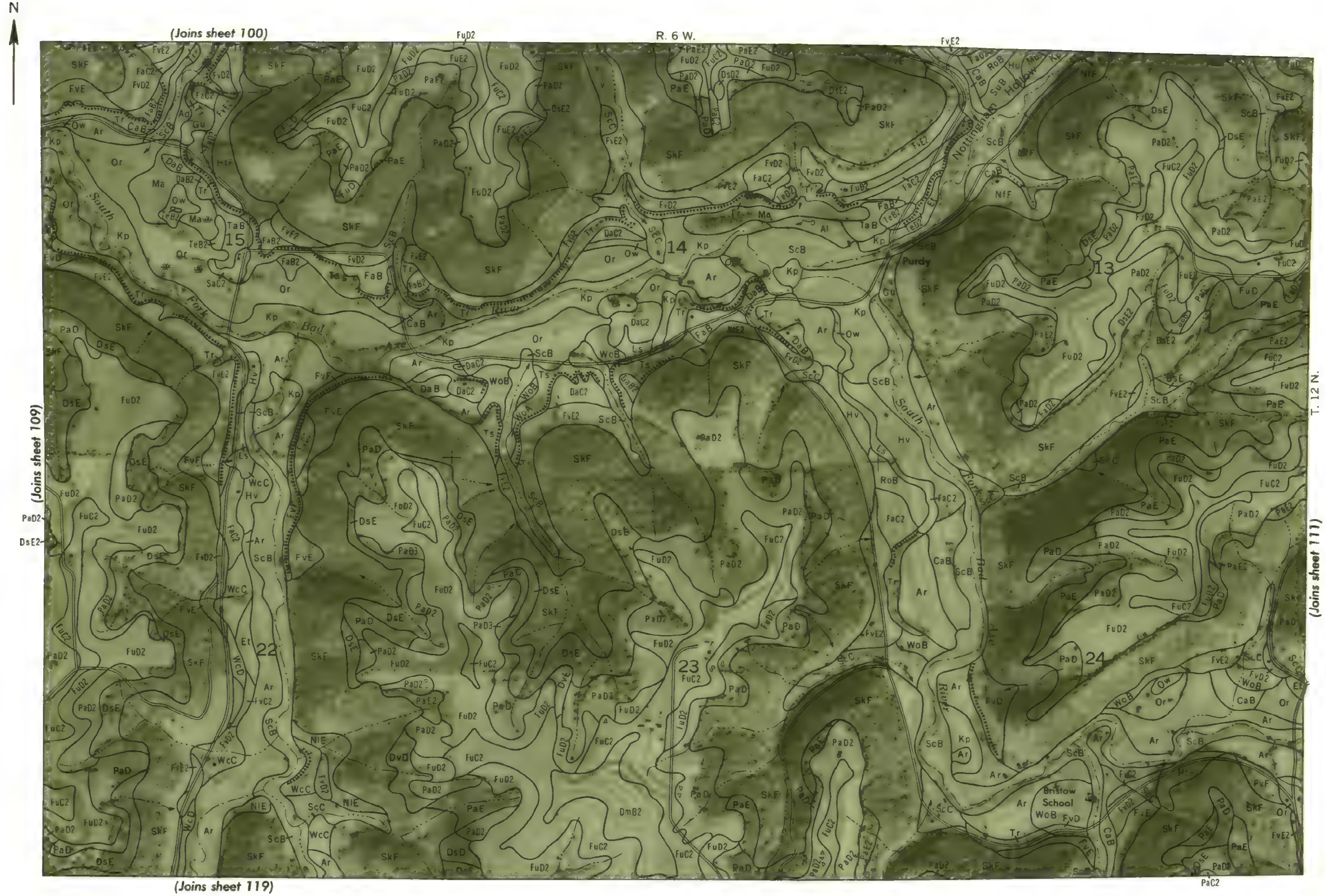

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 110

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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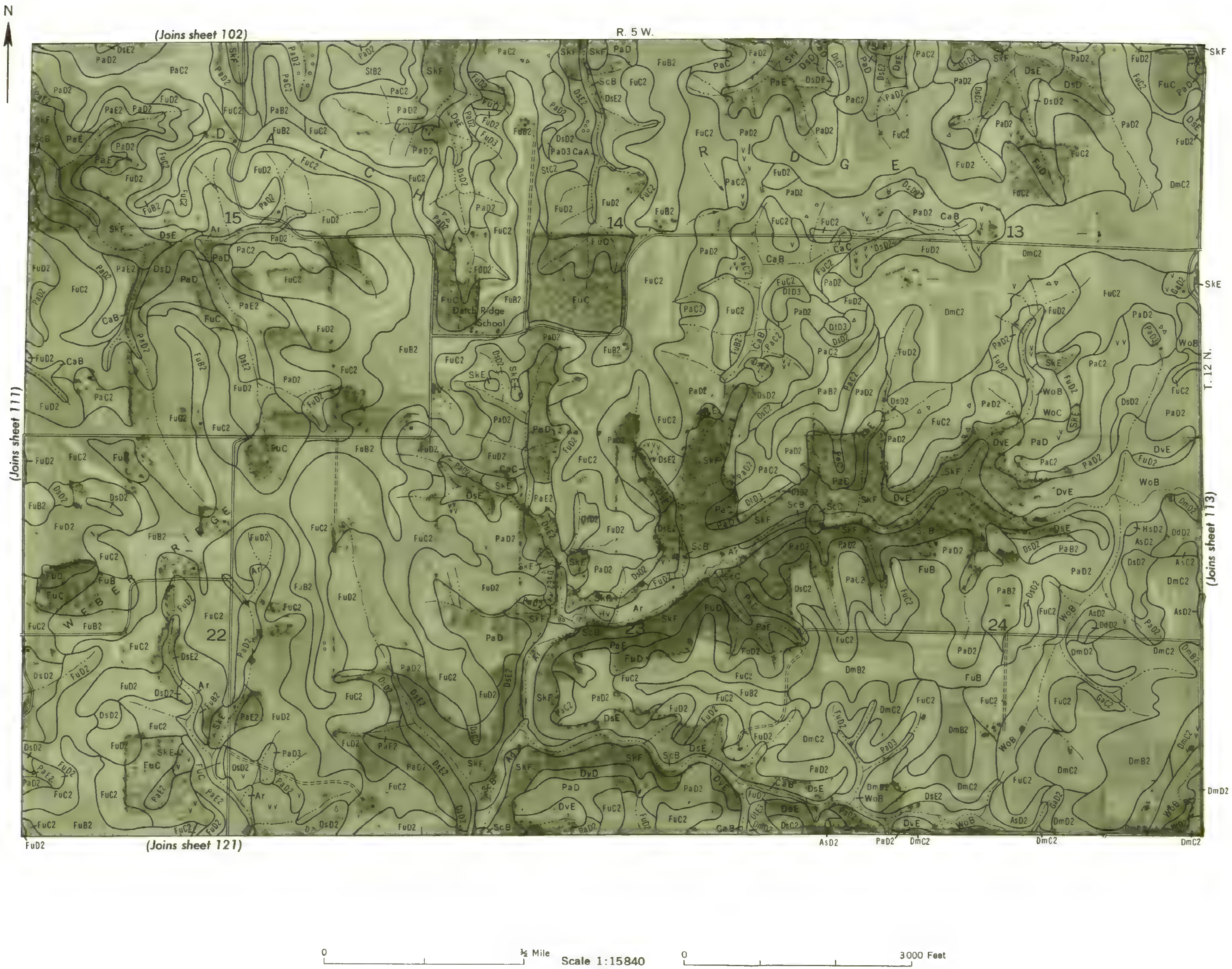
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 111

0 ½ Mile Scale 1:15840 0 3000 Feet

(112)



Scale 1:15840

VERNON COUNTY, WISCONSIN NO. 112

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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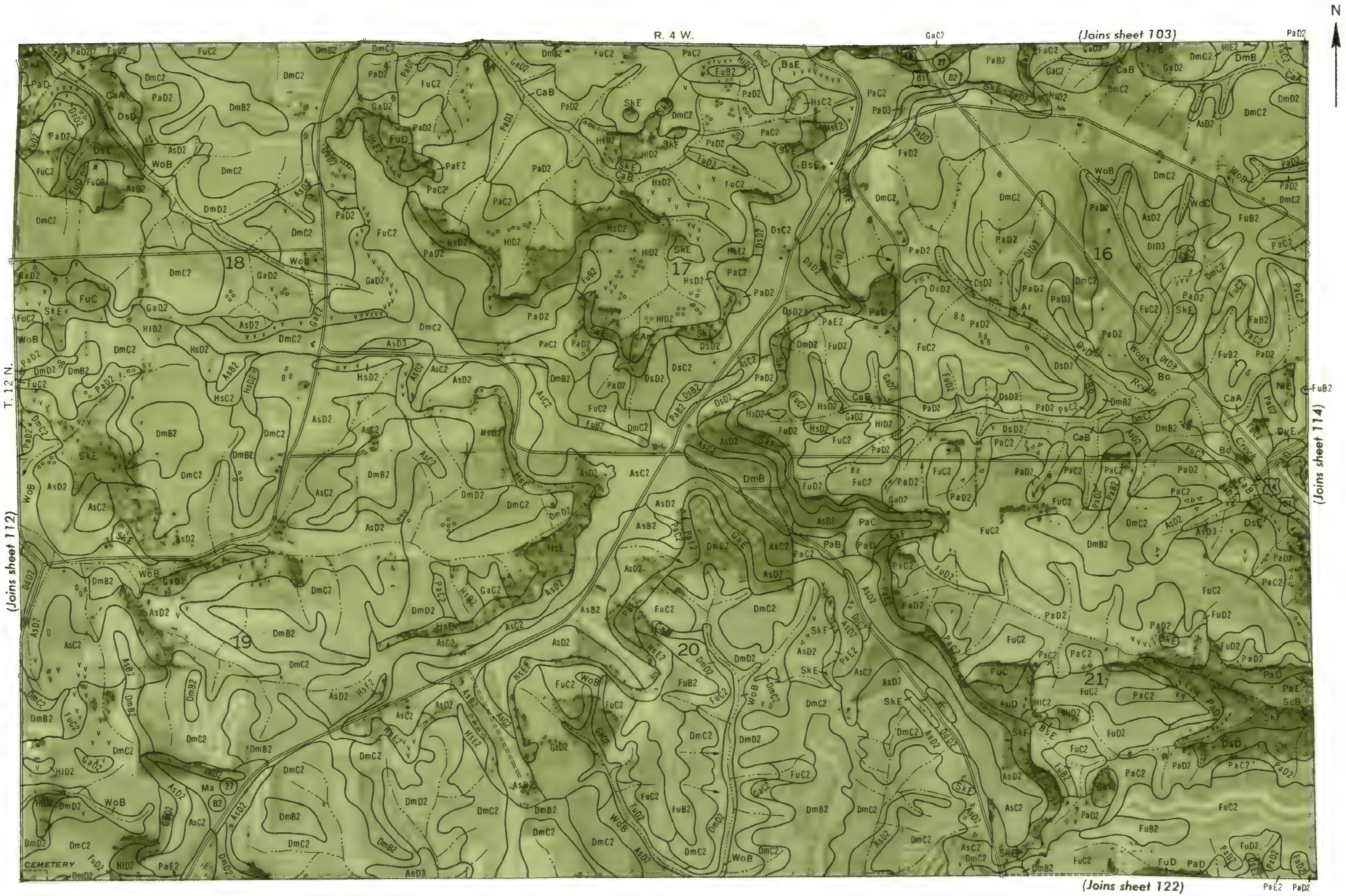


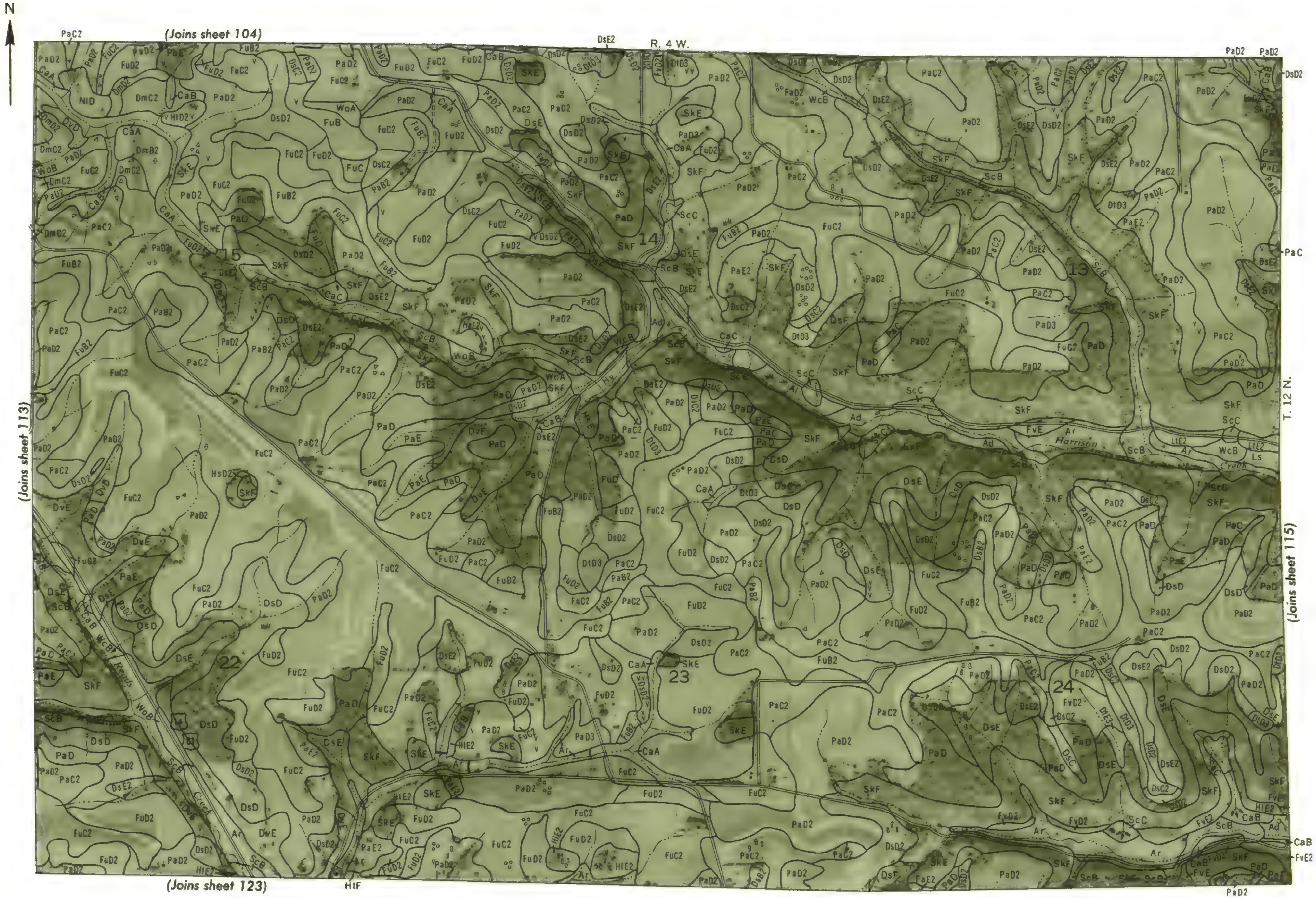
0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 113

114



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 114

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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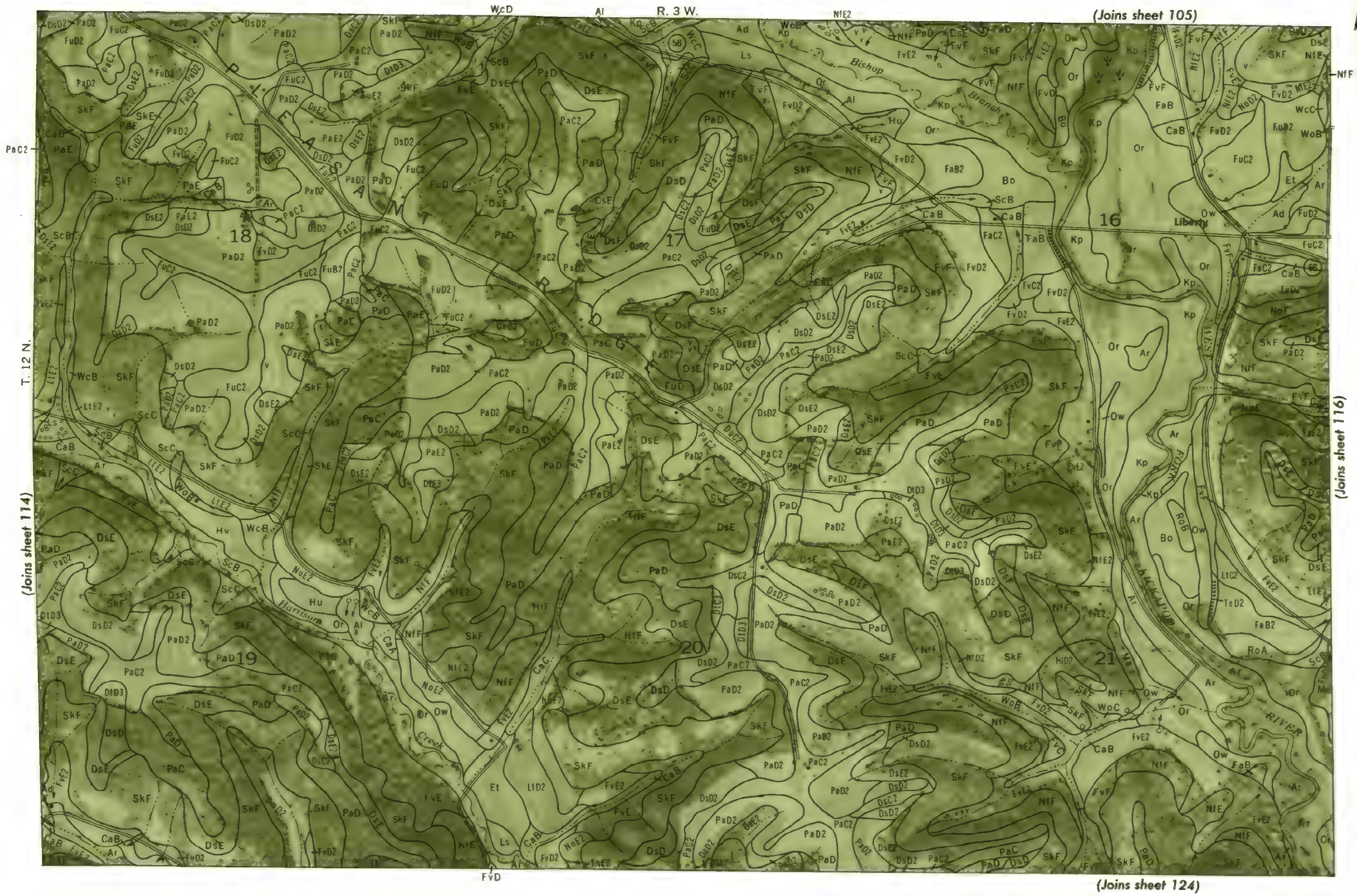
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 115



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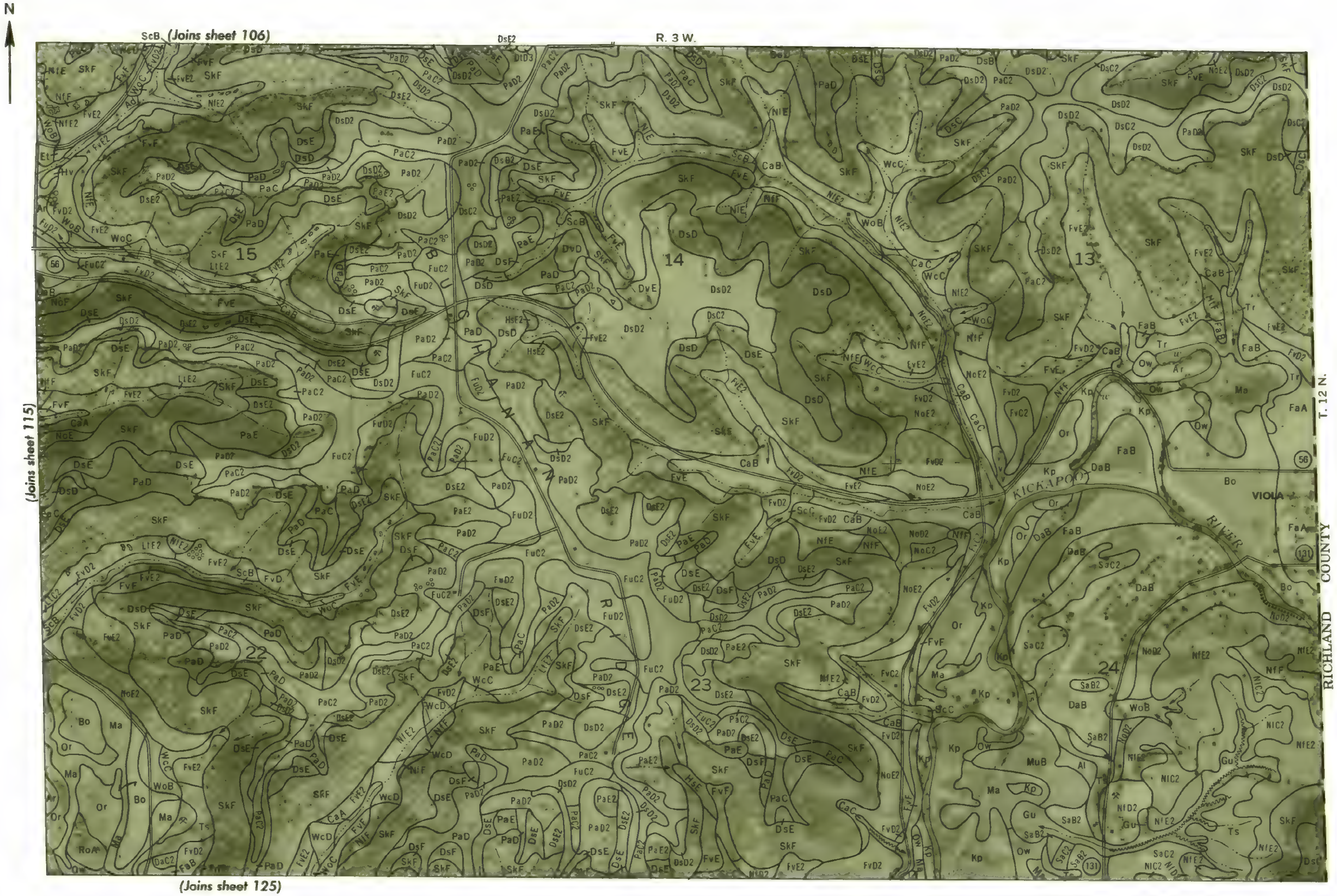

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 116

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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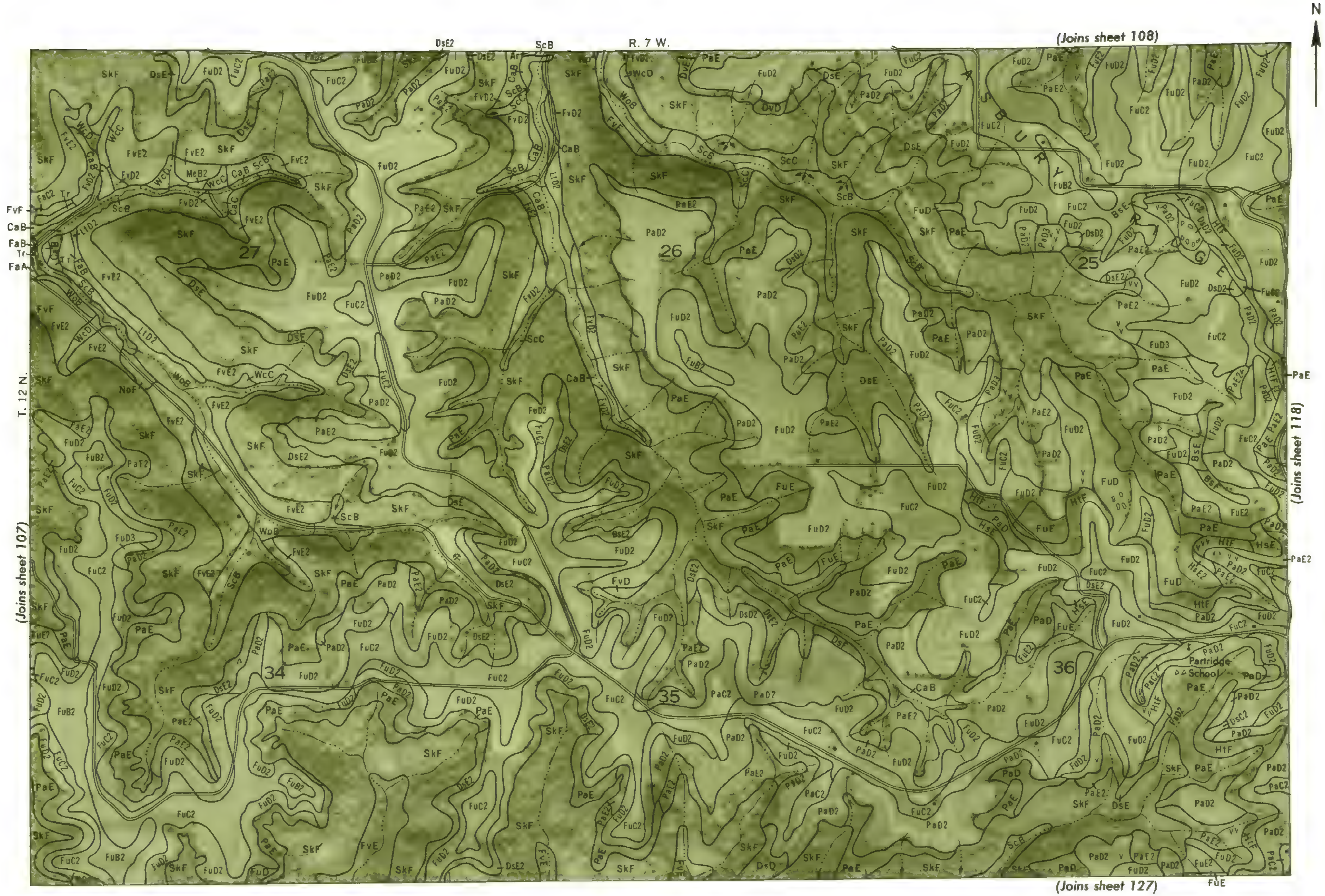
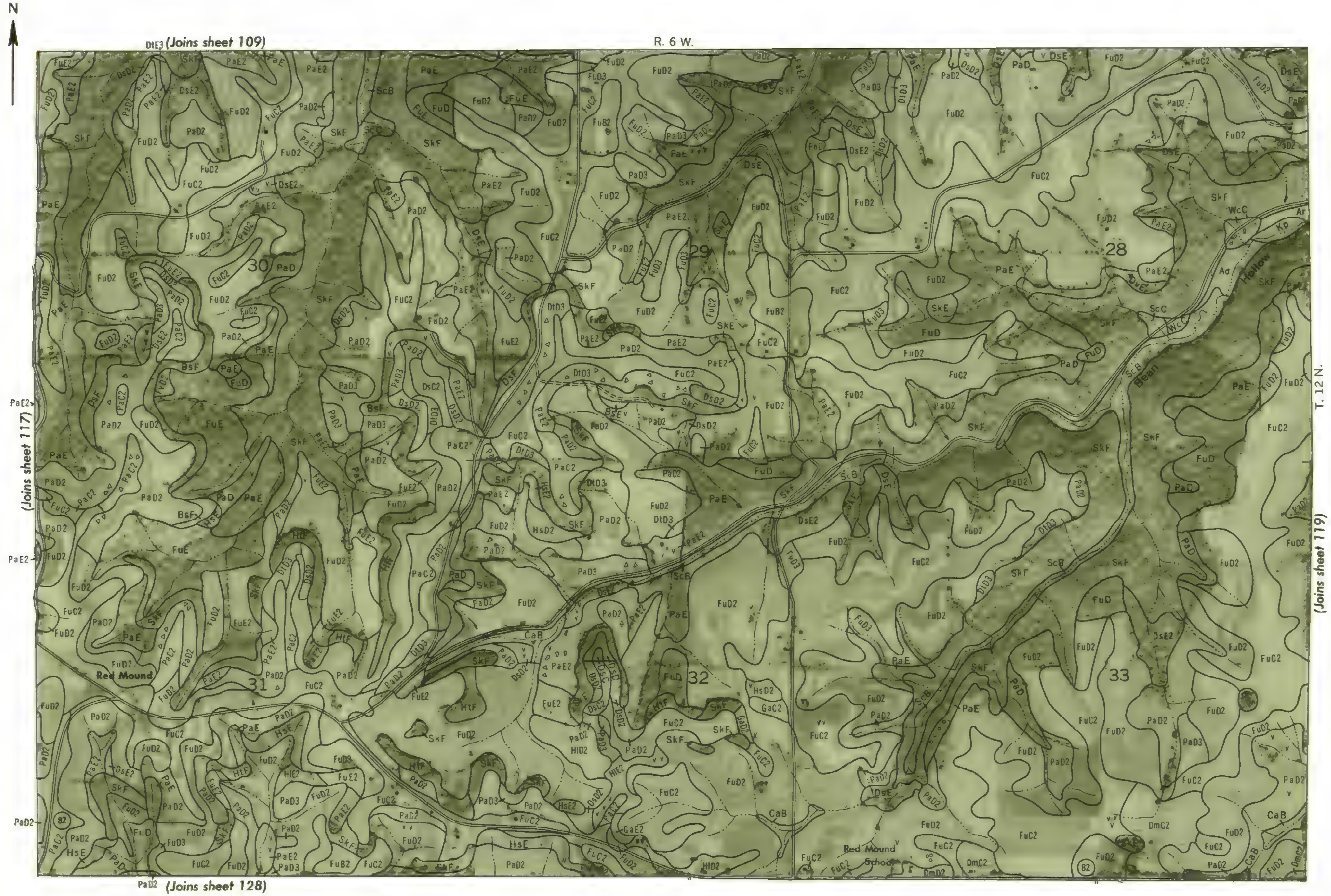
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 117



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN — SHEET NUMBER 118

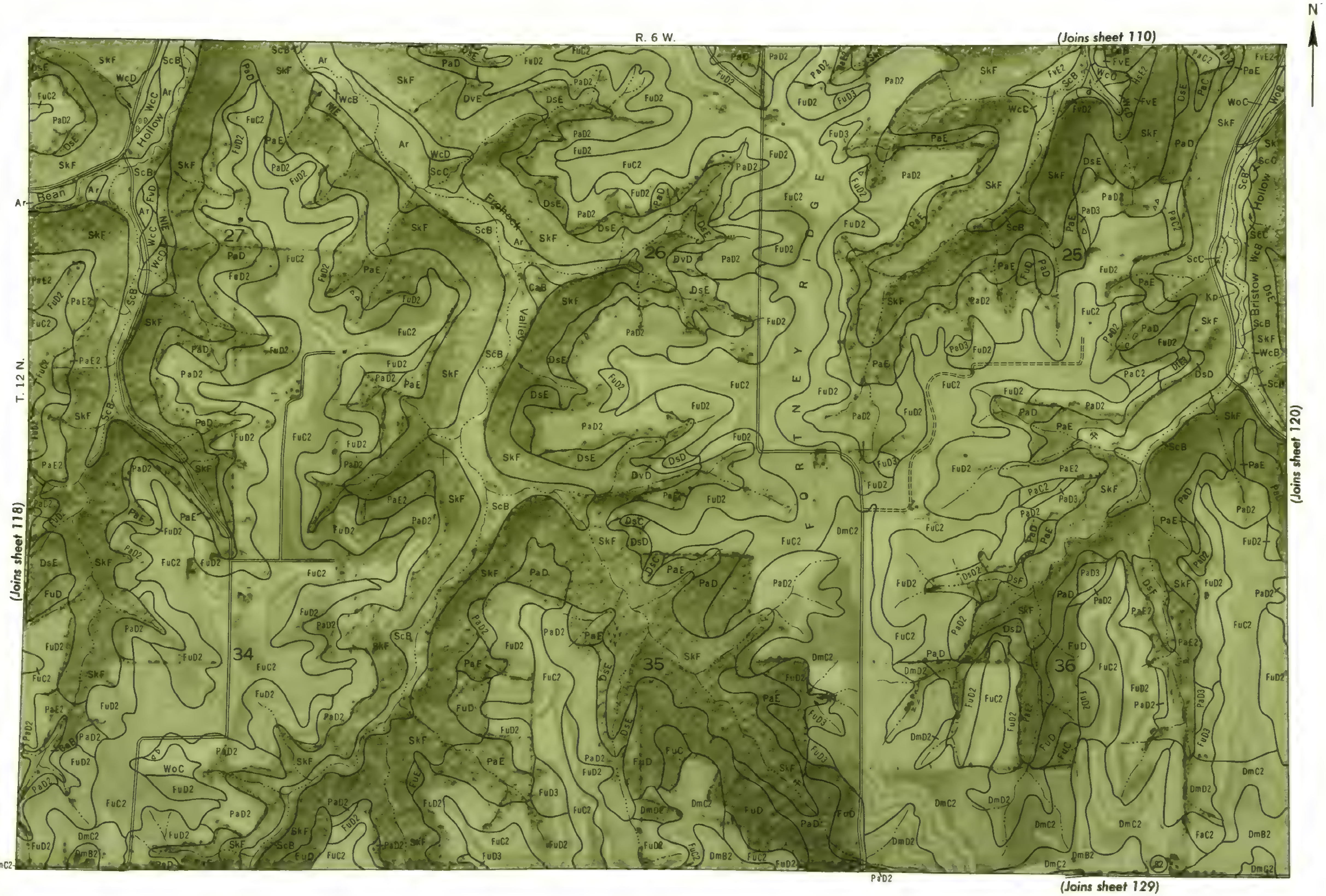


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 118

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

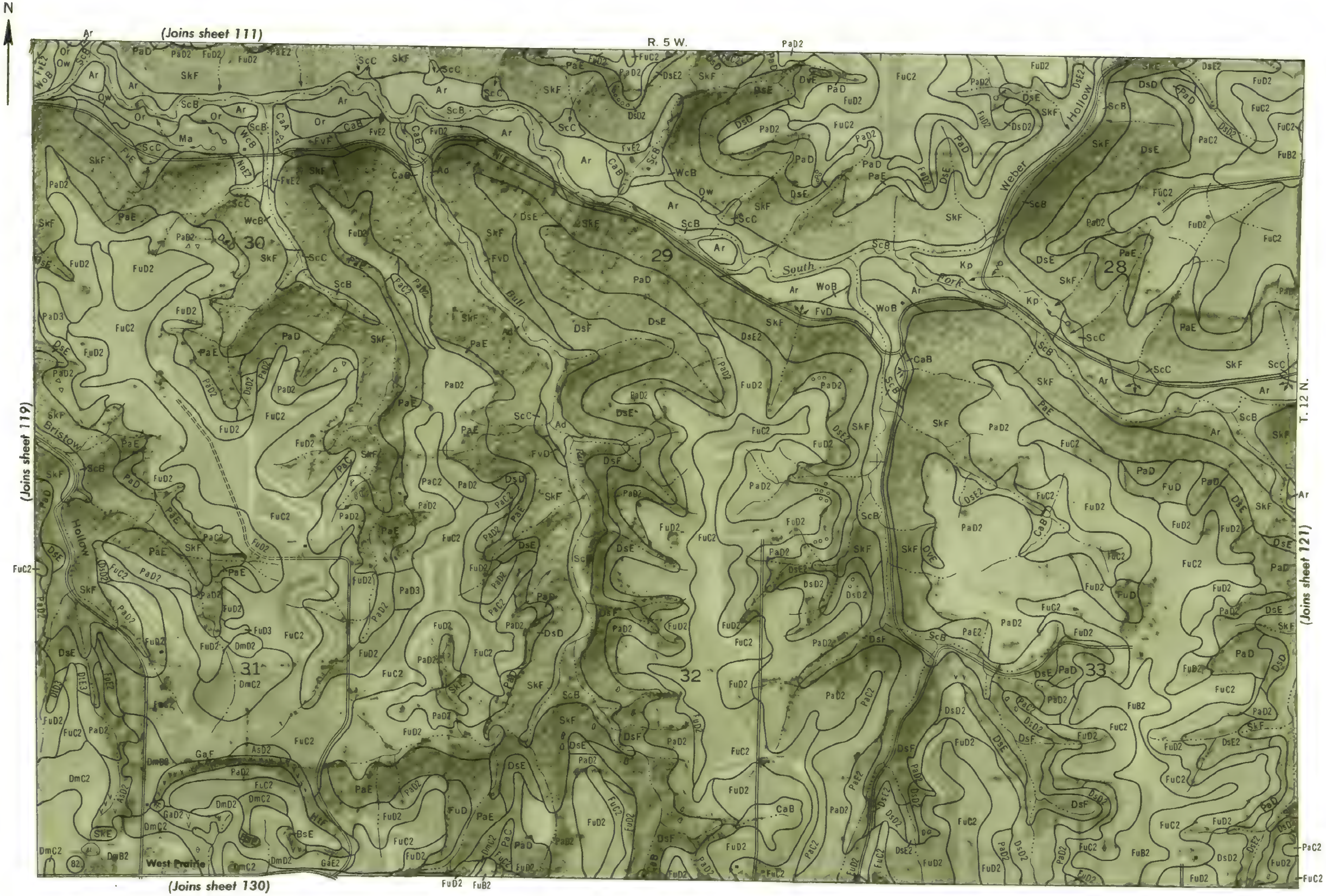


0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station

Land division corners are approximately positioned on this map.

(120)

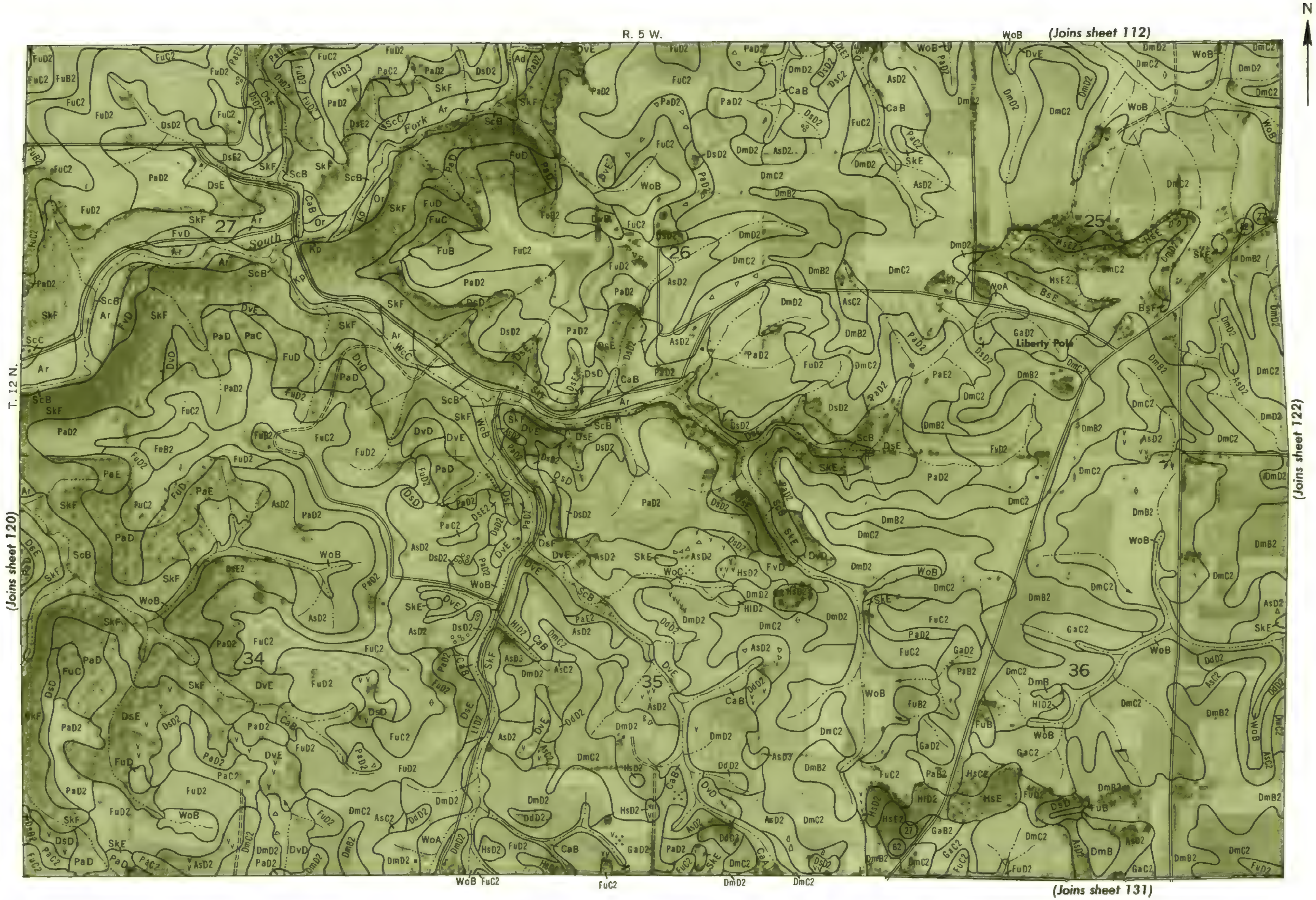


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 120

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

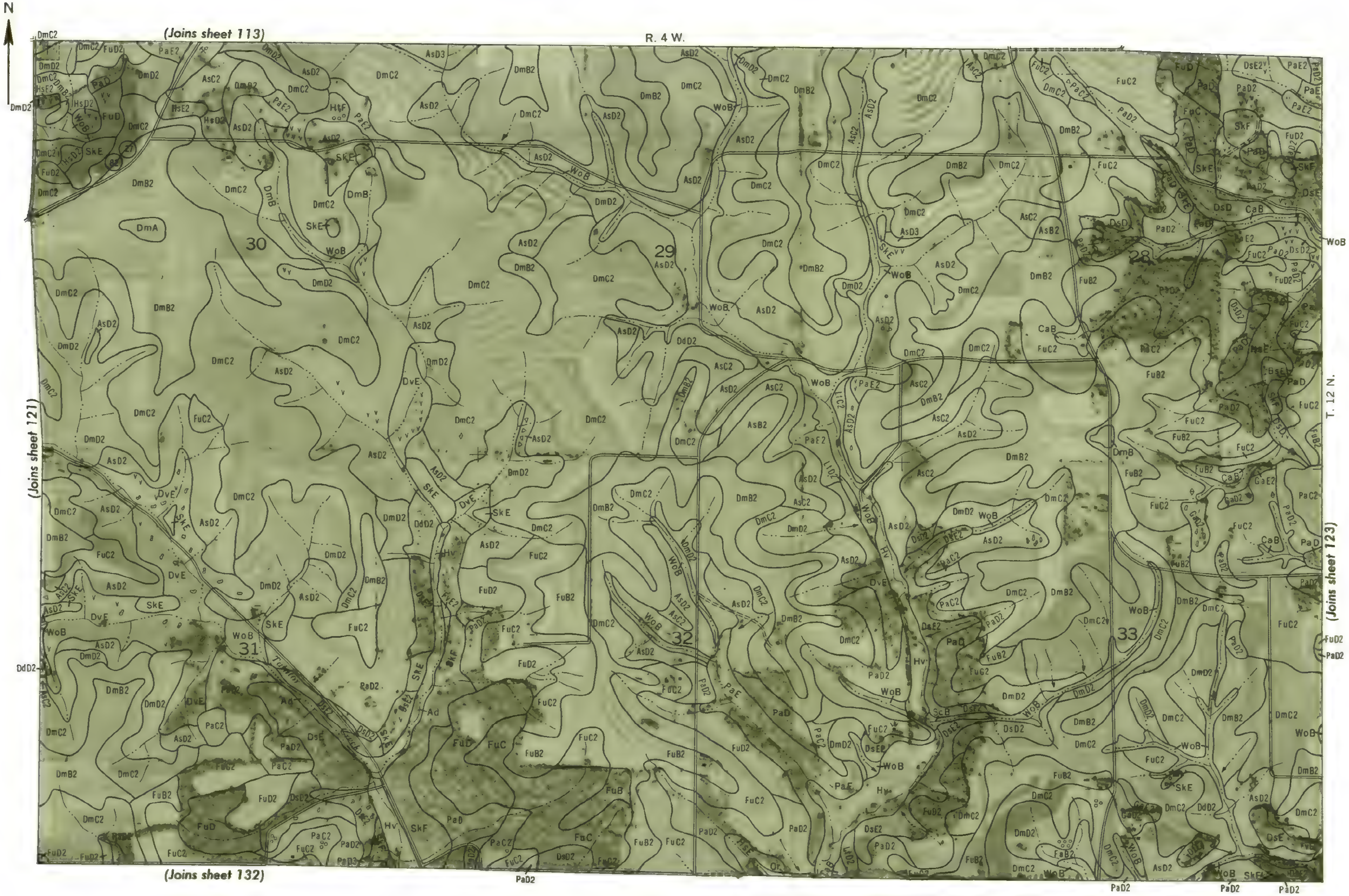


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 121

Land division corners are approximately positioned on this map.

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

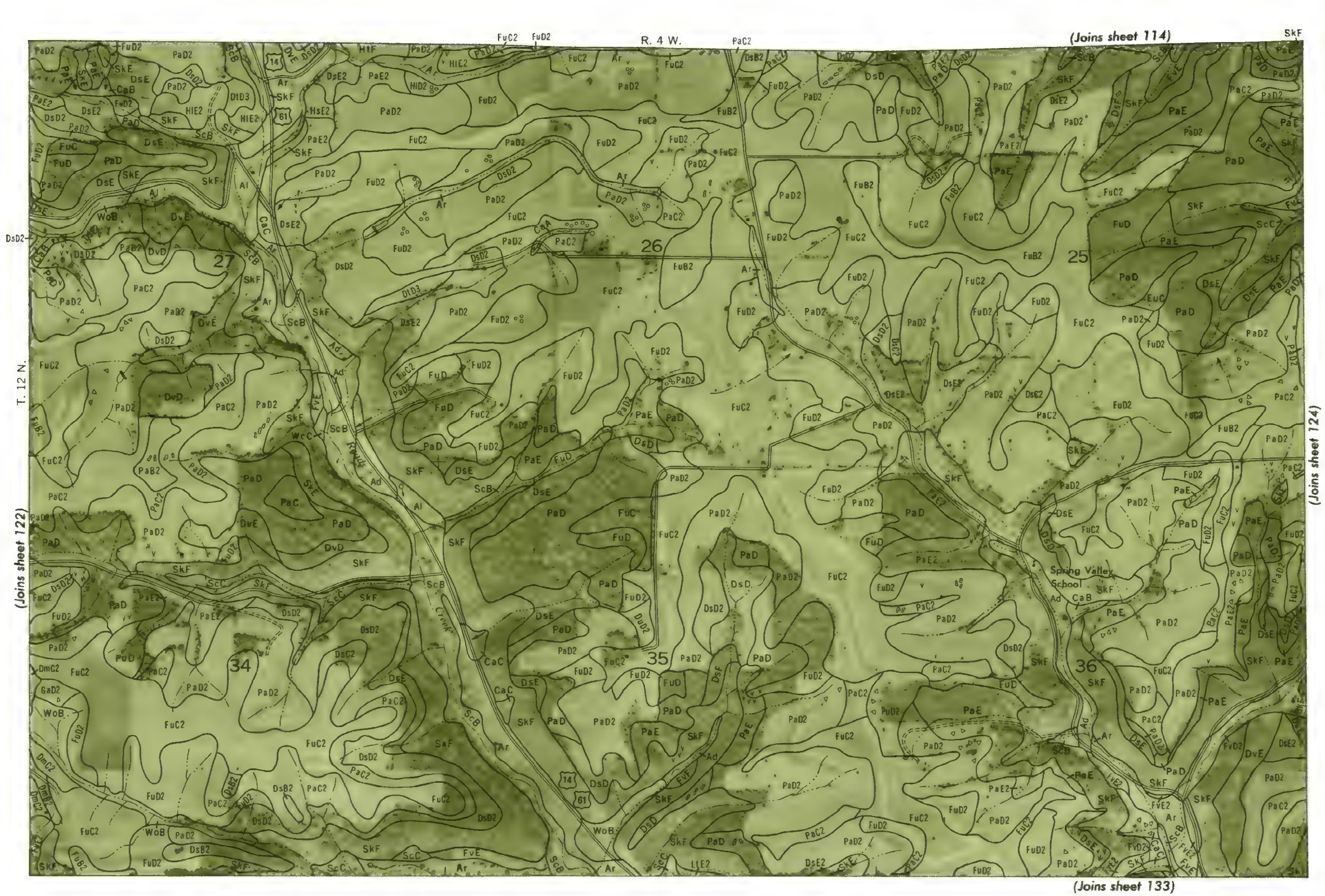


0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 122

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

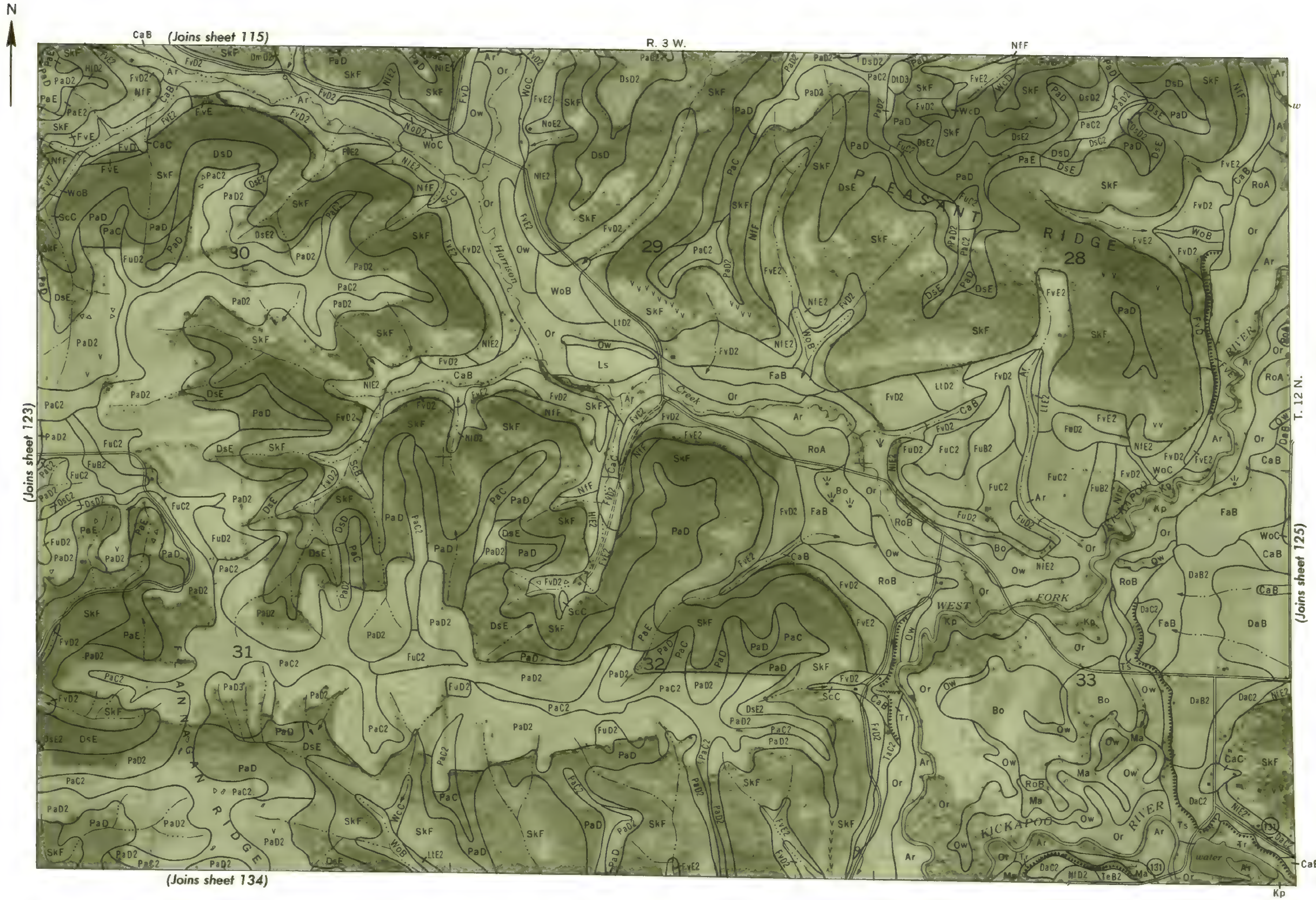


0 ½ Mile Scale 1:15840 0 3000 Feet

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 123



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 124

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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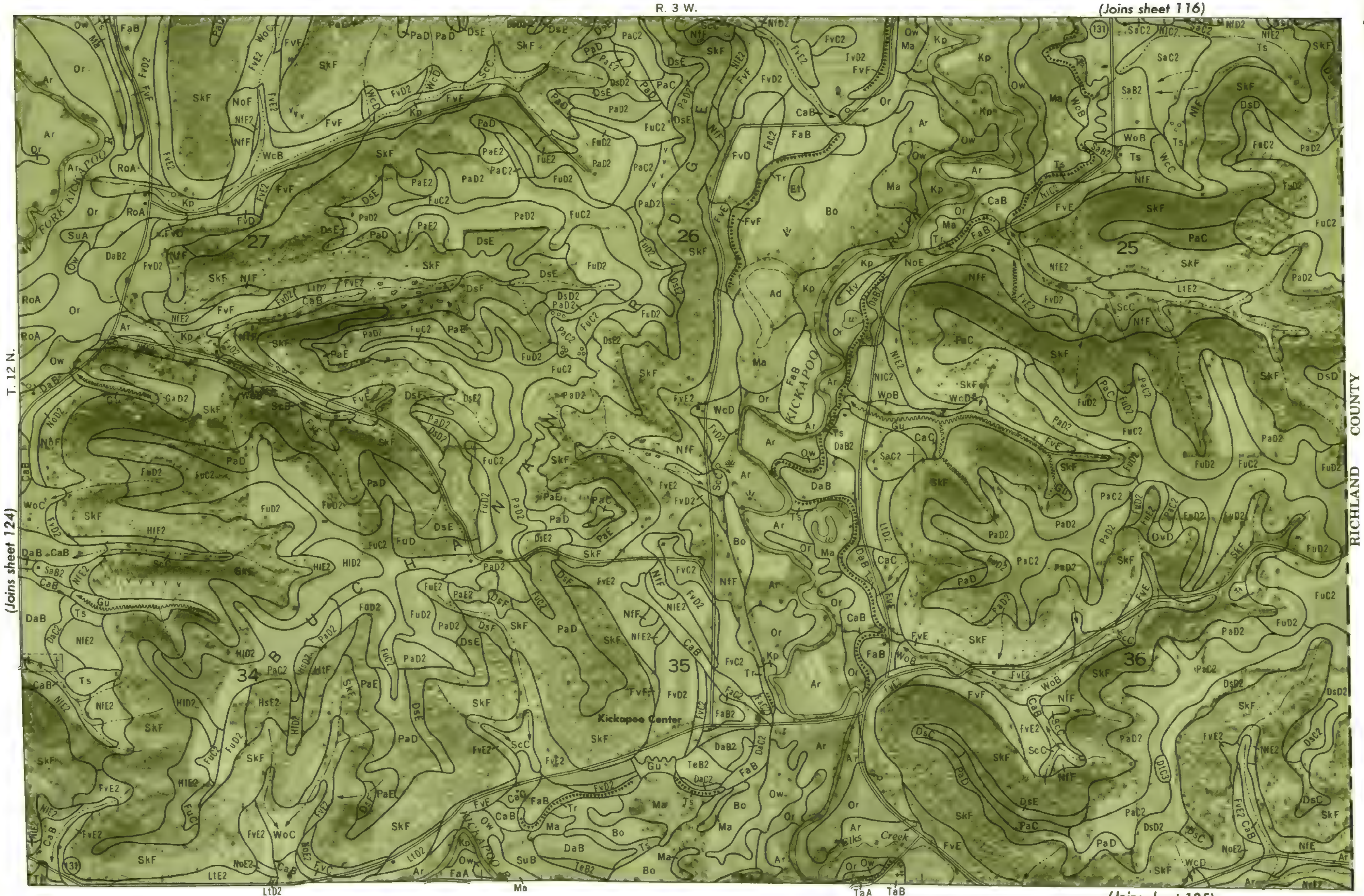
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 125

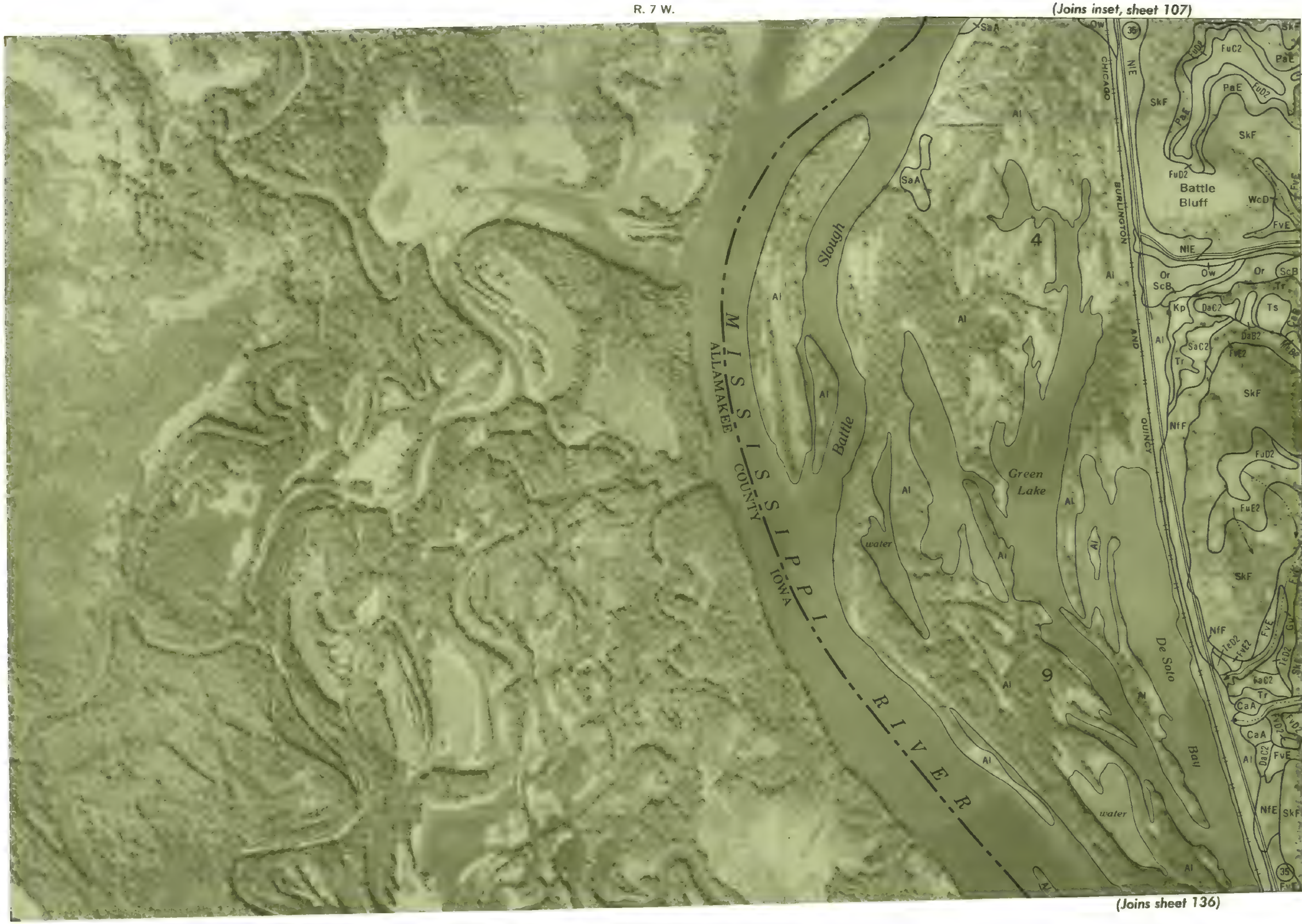


0 ¼ Mile Scale 1:15840 0 3000 Feet

N

R. 7 W.

(Joins inset, sheet 107)



T. 11 N.

(Joins sheet 127)

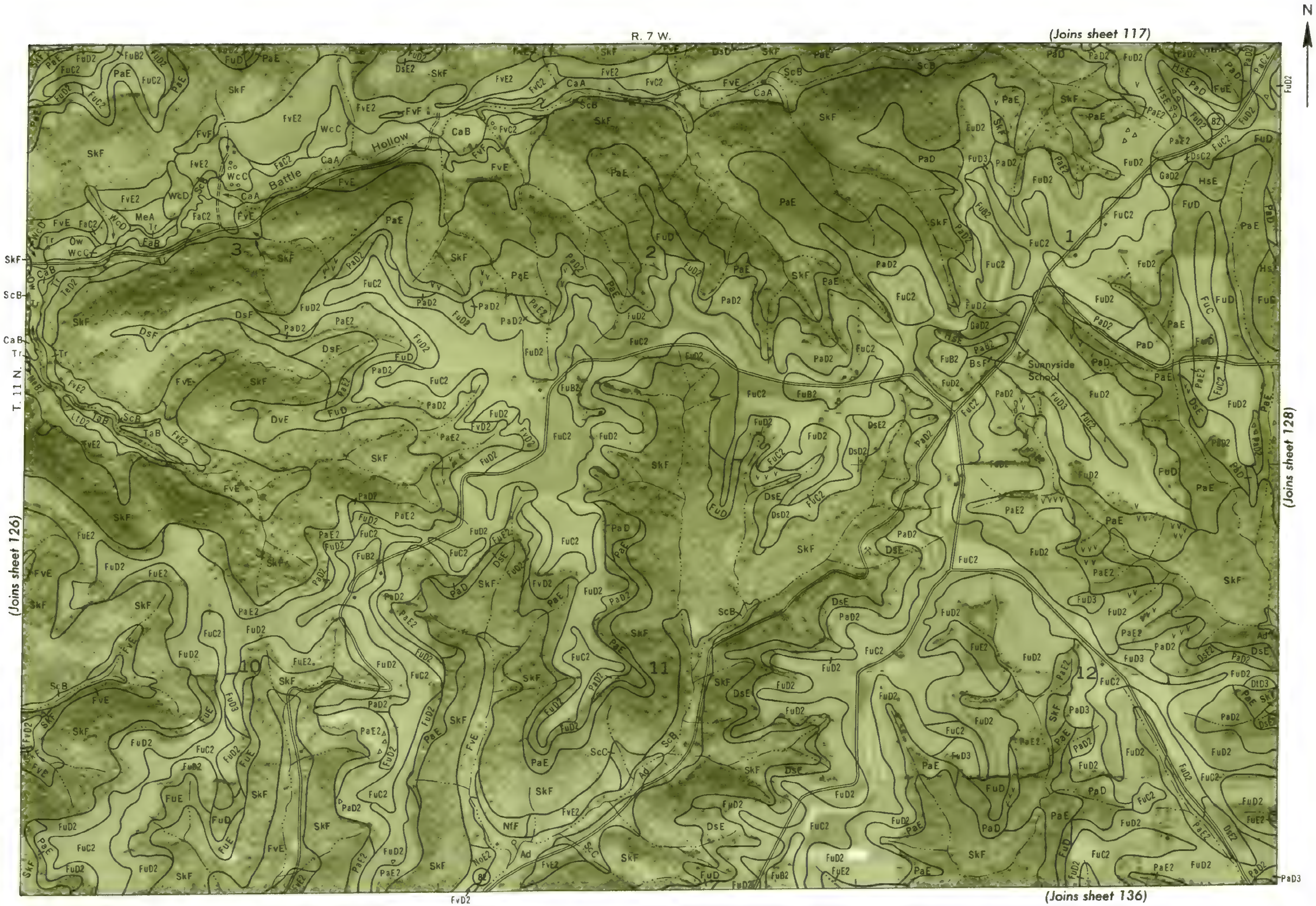
(Joins sheet 136)

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 126

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

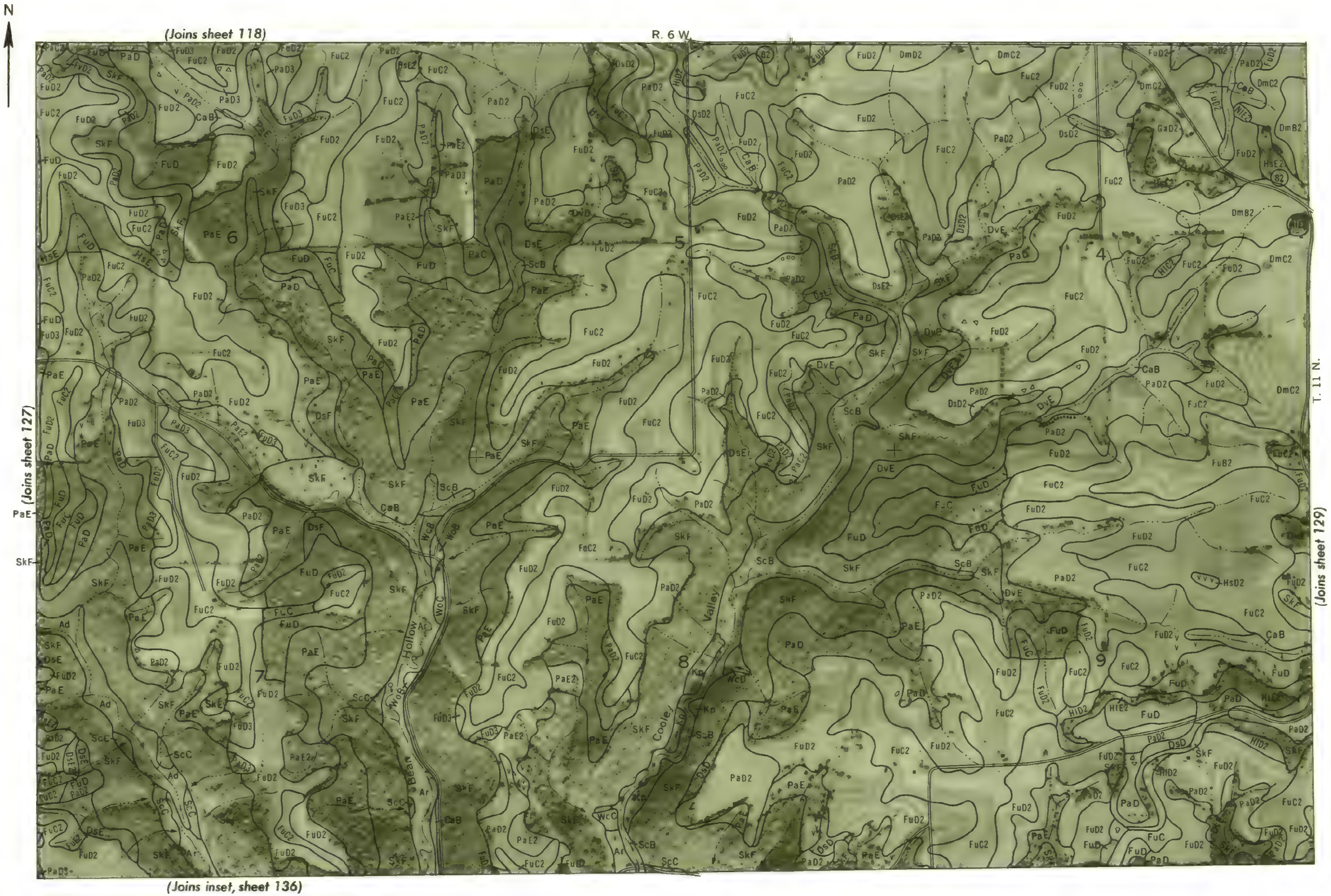
This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 127

VERNON COUNTY, WISCONSIN — SHEET NUMBER 128

128



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 128

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

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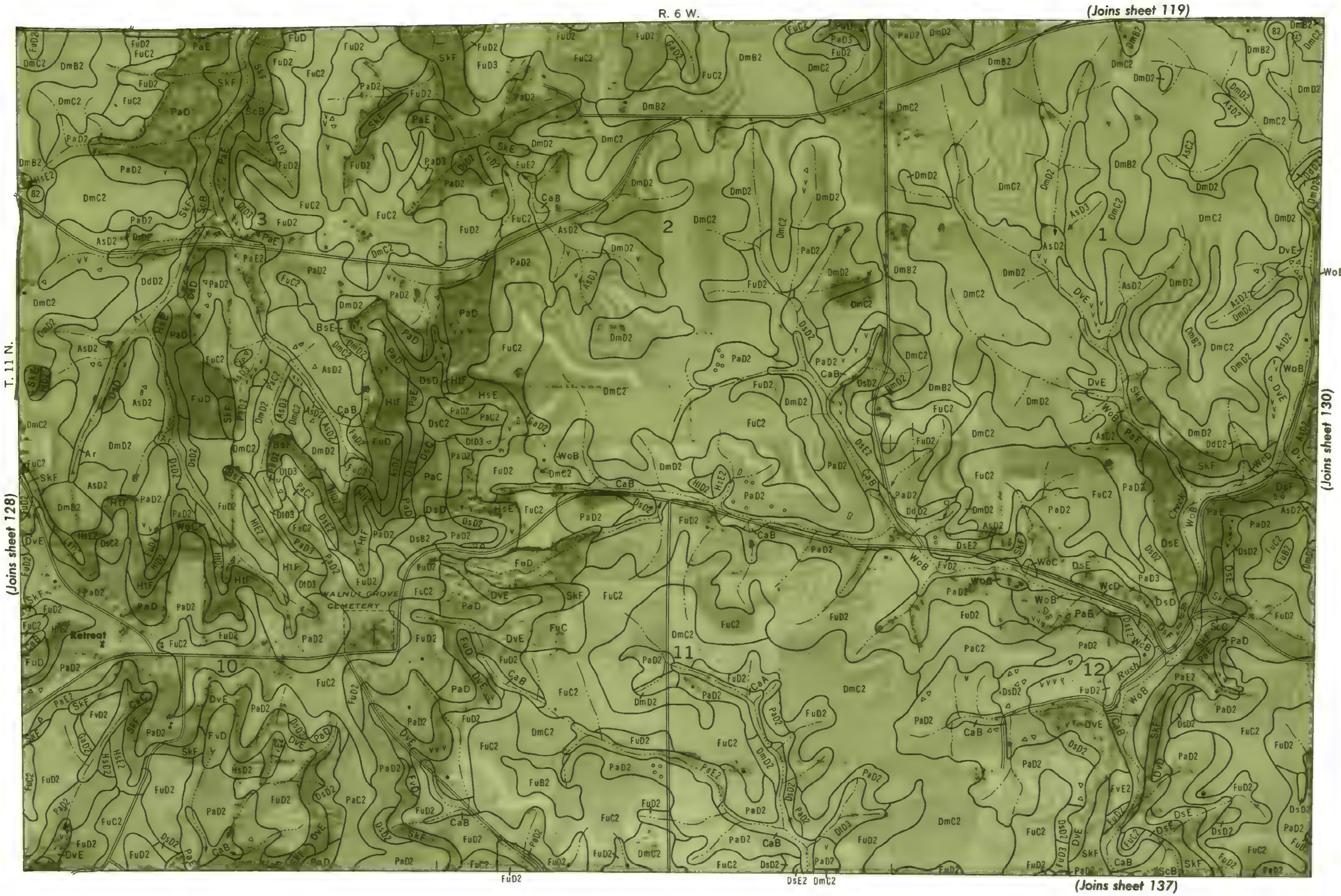
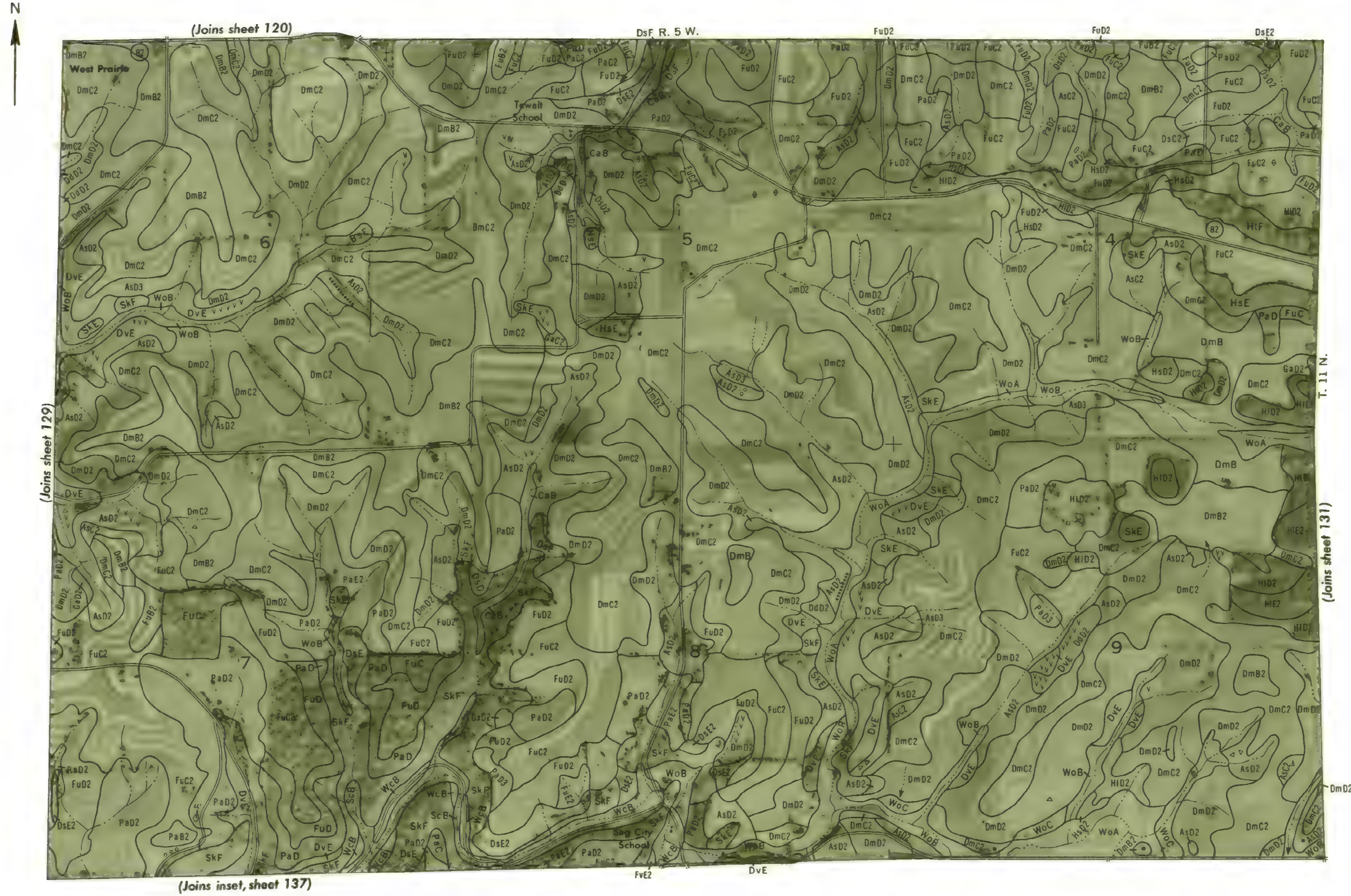
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 129

N



0 ½ Mile Scale 1:15840 0 3000 Feet



0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 130

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

VERNON COUNTY, WISCONSIN NO. 131

Land division corners are approximately positioned on this map.

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

0 ½ Mile Scale 1:15840 0 3000 Feet

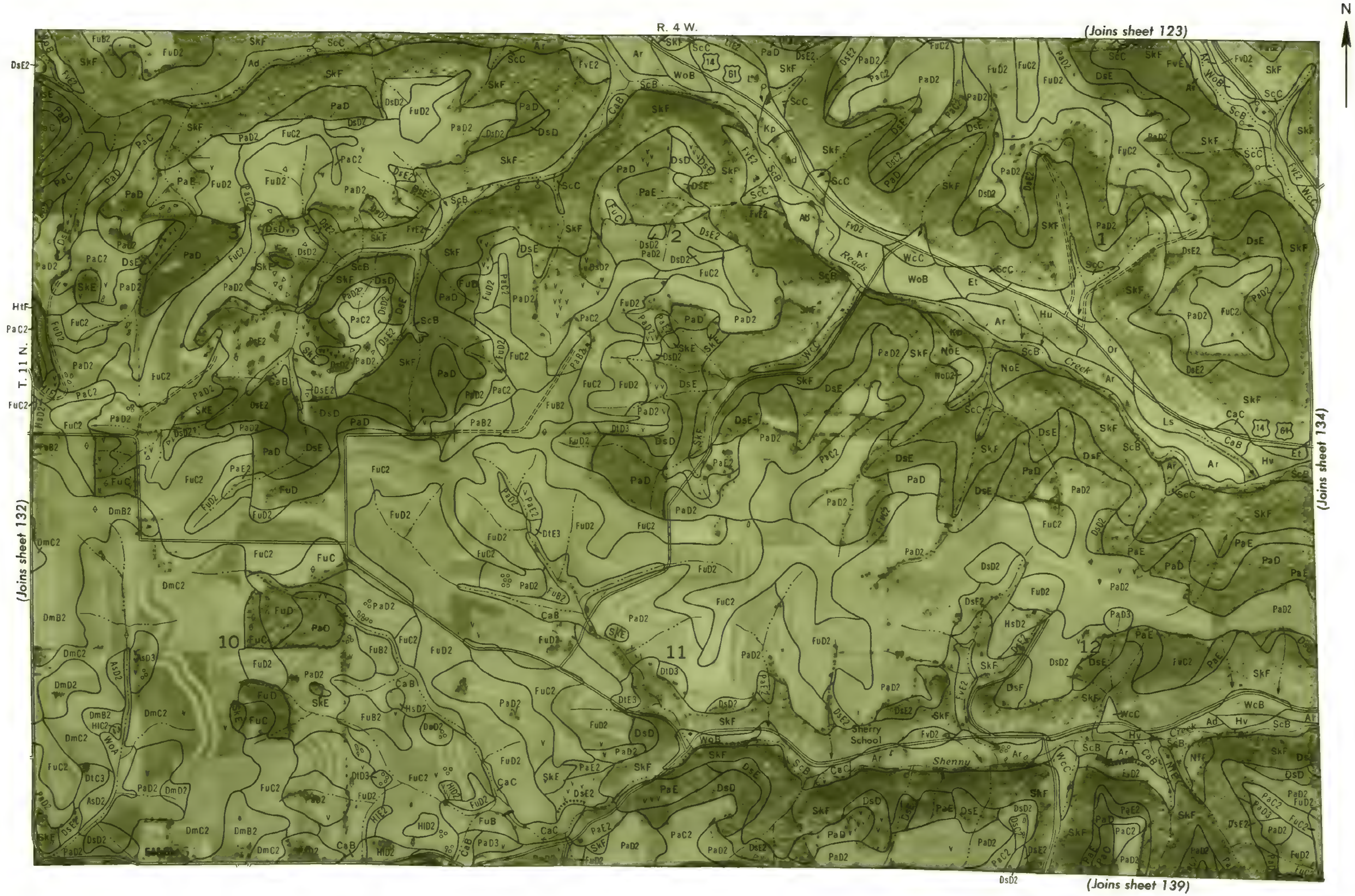
132

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 132

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.



0 ½ Mile Scale 1:15840 0 3000 Feet

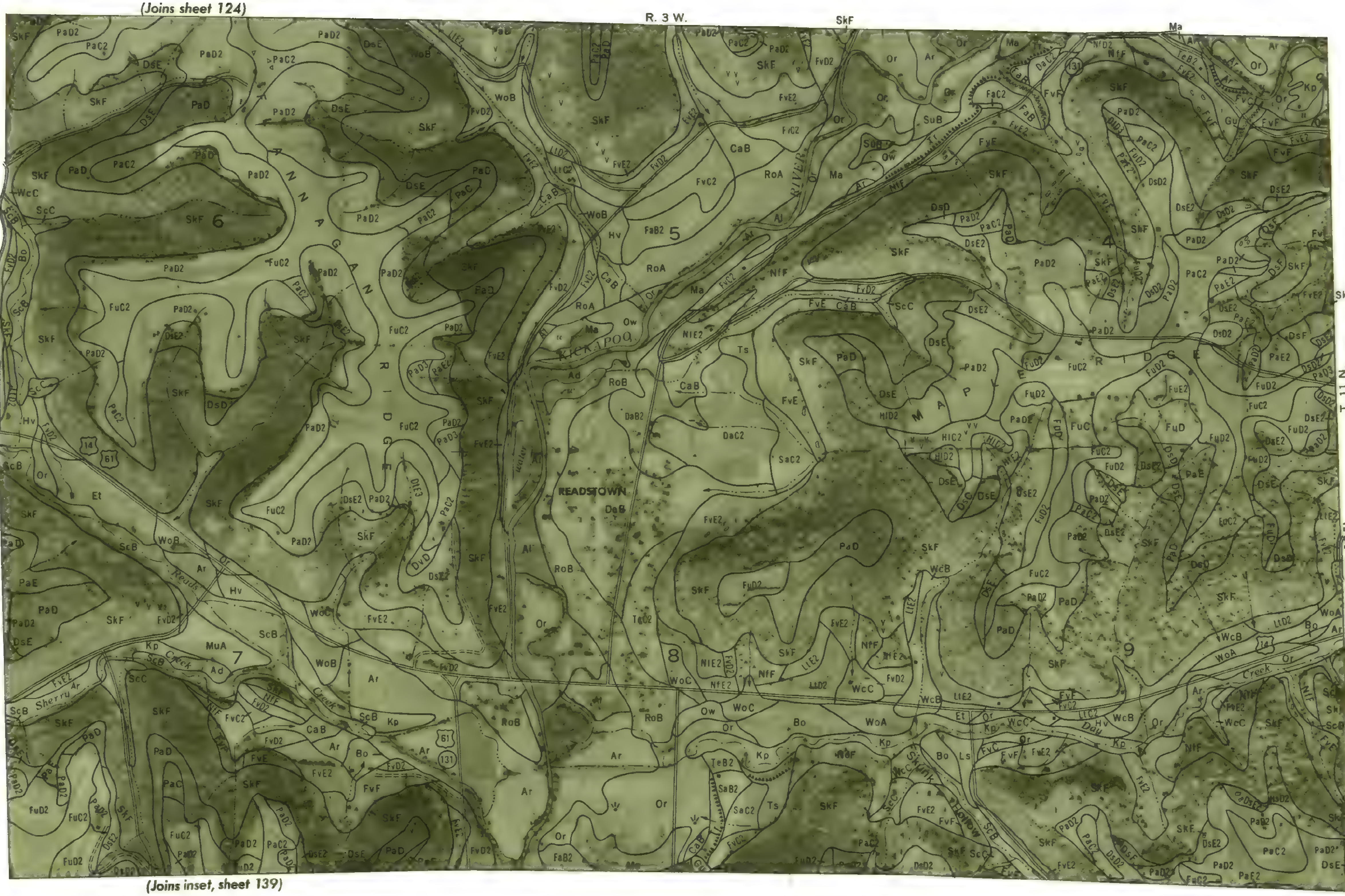
Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 133

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

N

(Joins sheet 124)



(Joins sheet 133)

(Joins sheet 135)

(Joins inset, sheet 139)

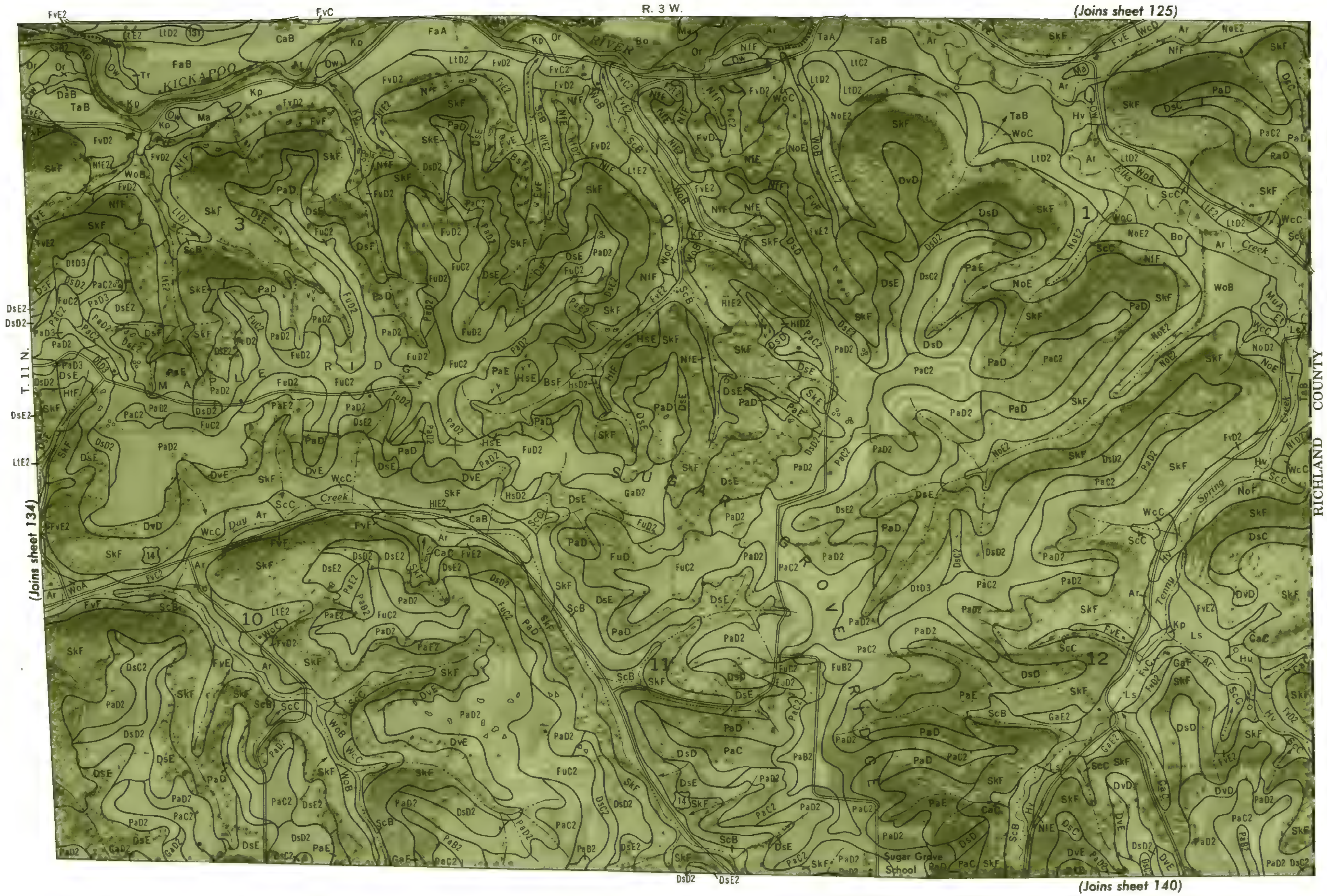
0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 134

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

N



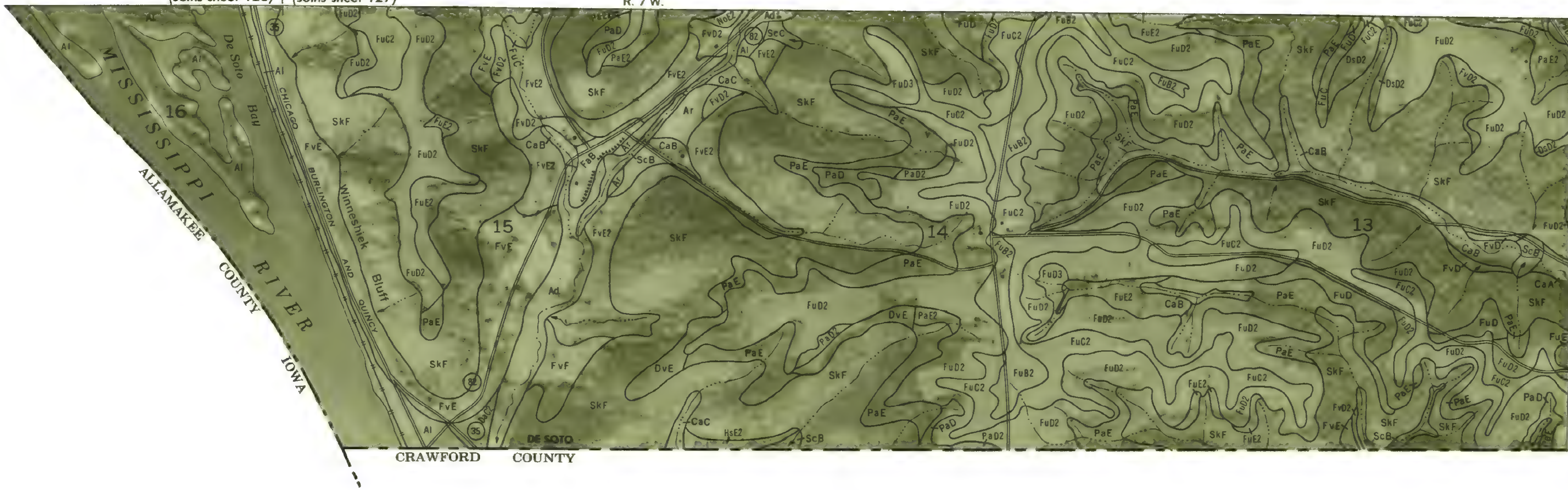
0 ½ Mile Scale 1:15840 0 3000 Feet

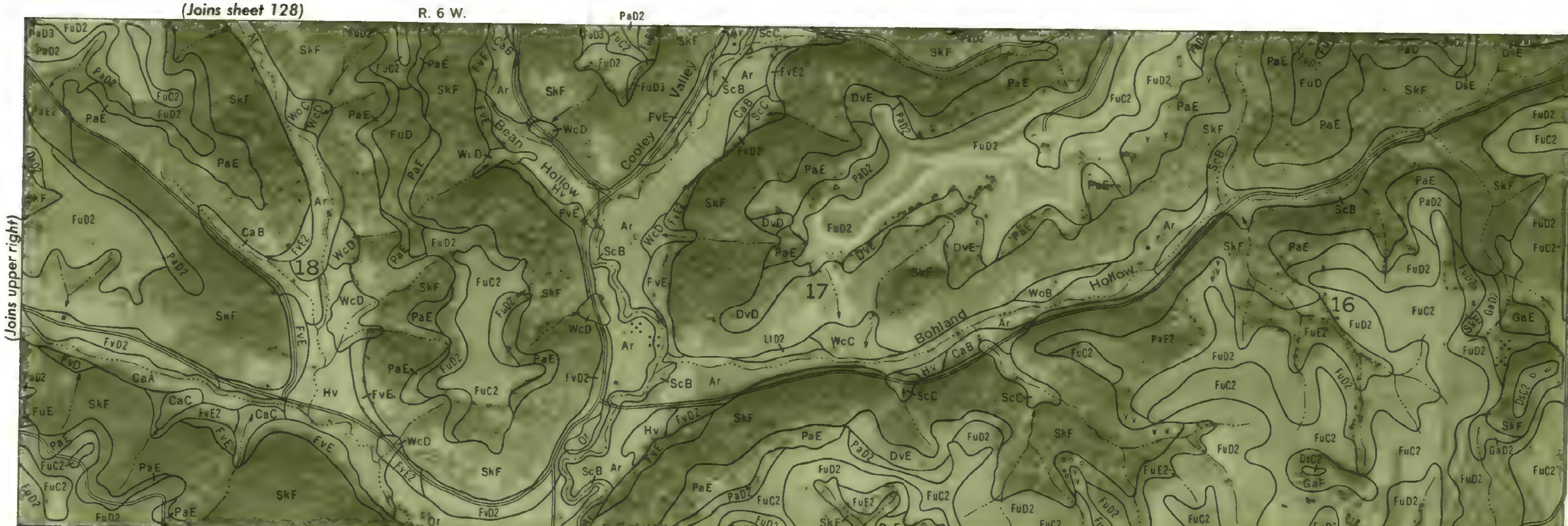
VERNON COUNTY, WISCONSIN NO. 135

Land division corners are approximately positioned on this map.

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

VERNON COUNTY, WISCONSIN — SHEET NUMBER 136



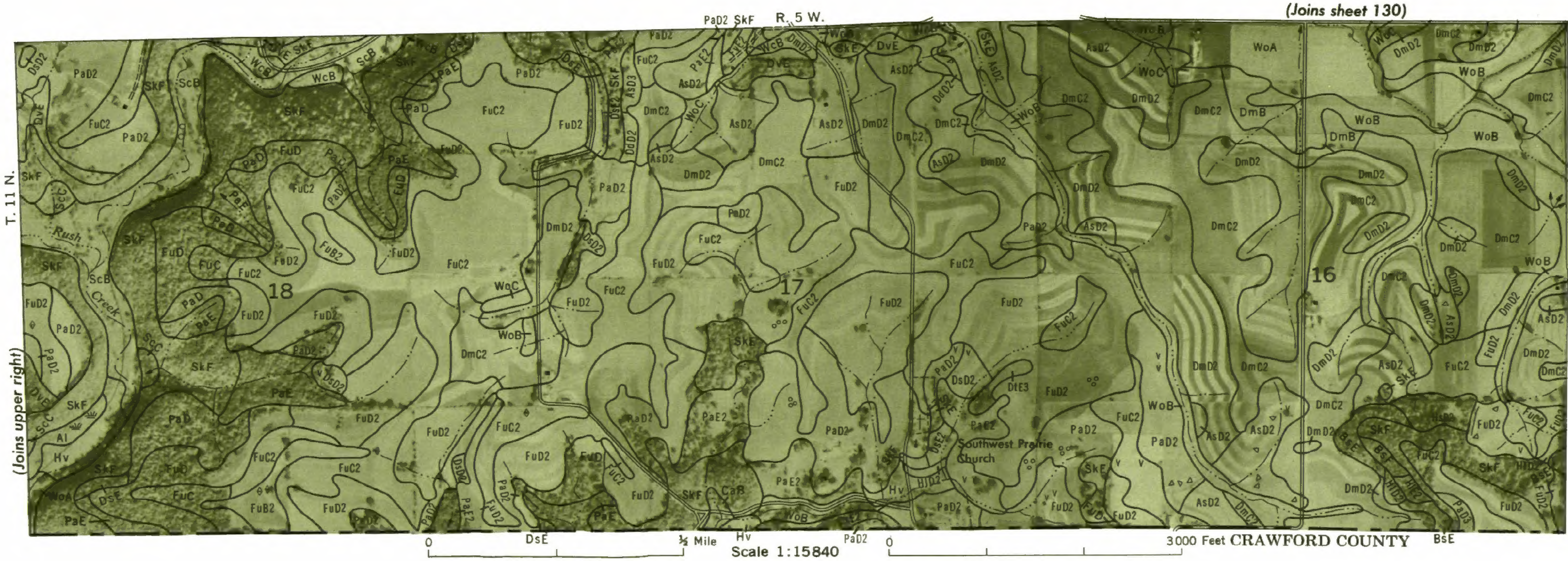


0 ½ Mile
Scale 1:15840
0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 136

This map is one of a set compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

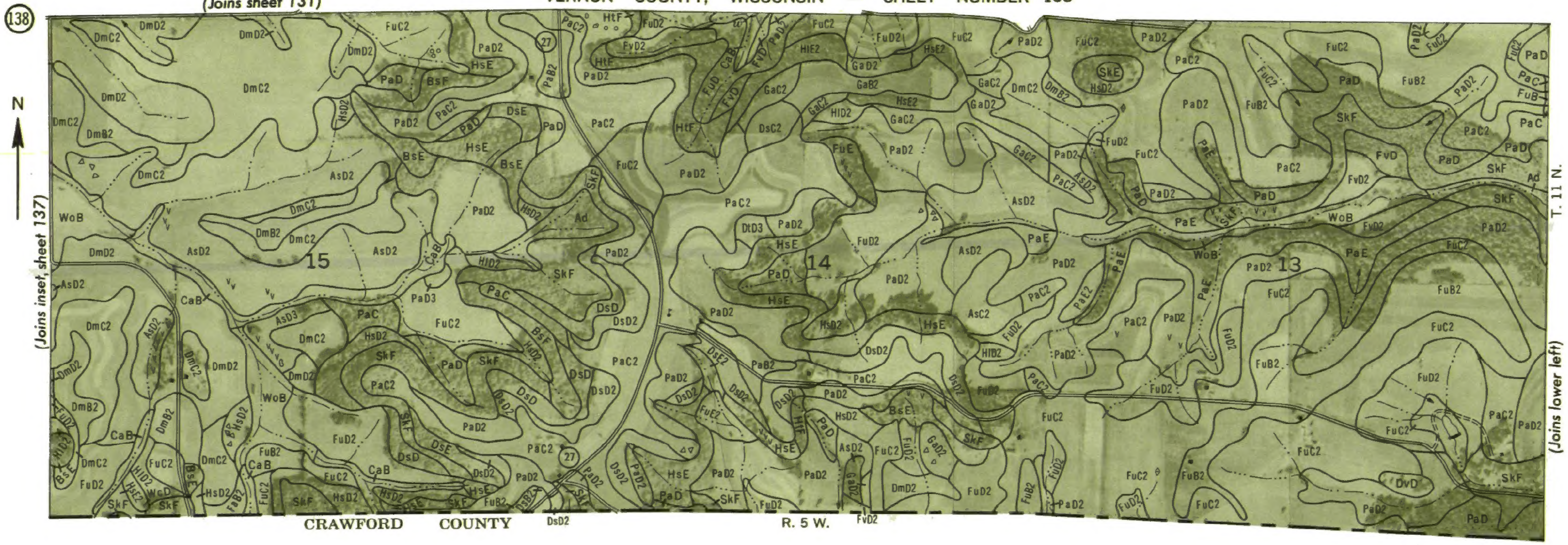
Land division corners are approximately positioned on this map.

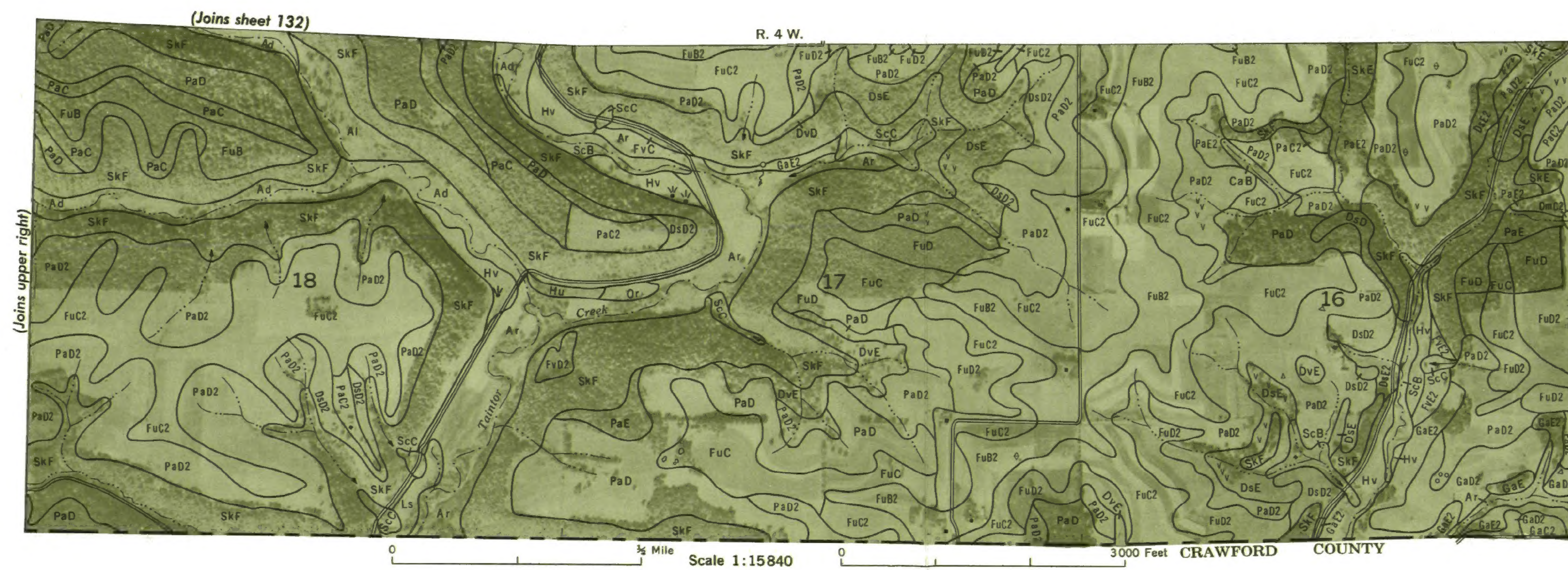


This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN — SHEET NUMBER 138



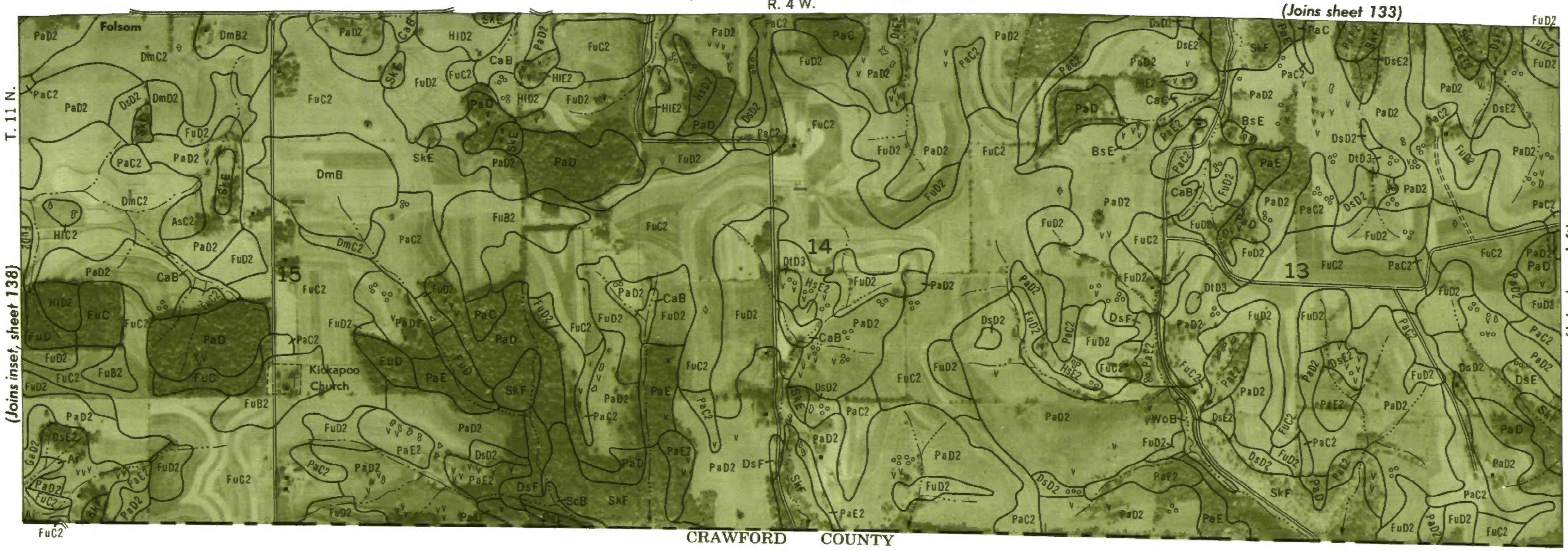


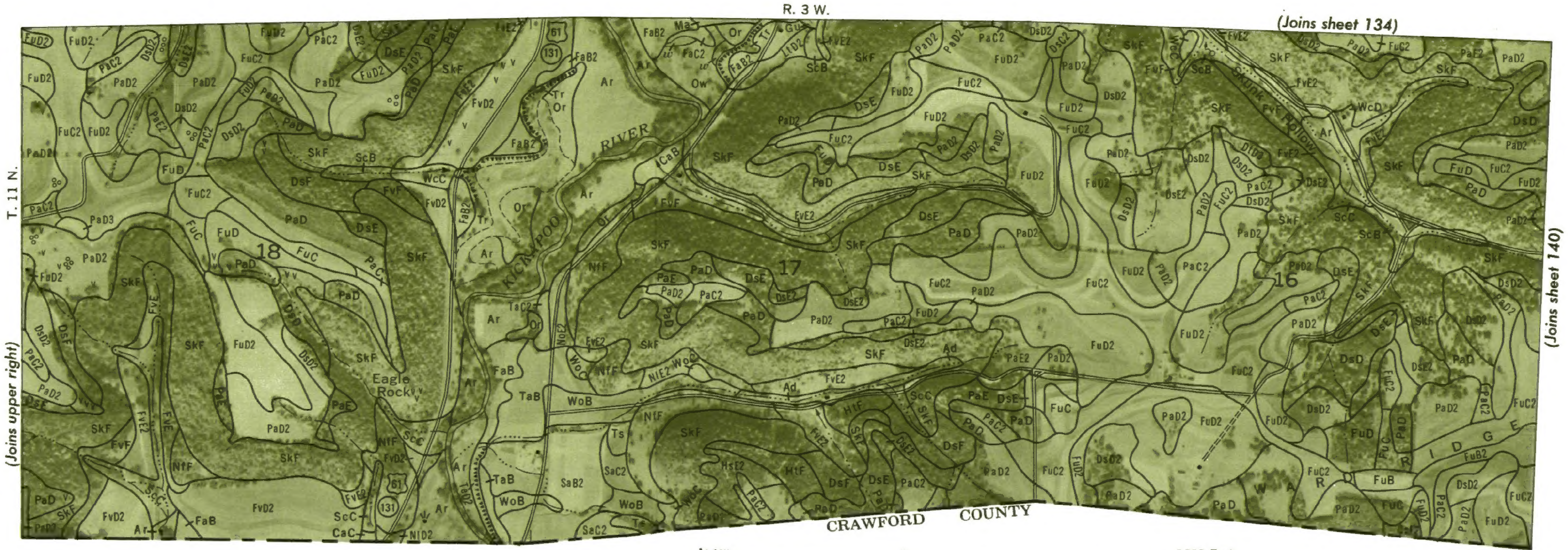
VERNON COUNTY, WISCONSIN NO. 138

This map is one of a set of compiled in 1968 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the University of Wisconsin, Wisconsin Geological and Natural History Survey, Soil Survey Division, and Wisconsin Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN — SHEET NUMBER 139





0 ½ Mile Scale 1:15840 0 3000 Feet

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Land division corners are approximately positioned on this map.

VERNON COUNTY, WISCONSIN NO. 139

VERNON COUNTY, WISCONSIN — SHEET NUMBER 140

0 ½ Mile Scale 1:15840 0 3000 Feet

VERNON COUNTY, WISCONSIN NO. 140

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Land division corners are approximately positioned on this map.